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TROPICAL DISEASES BULLETIN.

Vol. 36.] 1939. [No. 10.

SUMMARY OF RECENT ABSTRACTS.

VIII. TYPHUS GROUP OF FEVERS.*

[It has not been found possible to adopt a satisfactory method of classification for the work here summarized. General information and work on vaccination have therefore been collected into a separate section, followed by sections on (1) the group predominantly positive to *Proteus OX19* (vectors : louse and flea), (2) that positive to *OXK* (vector : mite), and finally (3) the indeterminate group (vector : tick). These sections, however, cannot be rigidly separated.]

General.

The classification of the typhus group of fevers is not yet satisfactorily settled. BURNET (p. 356) suggests a provisional classification of the Rickettsial diseases which, though depending largely upon the vectors, is not rigidly confined to that method. This scheme is not based upon serological reactions. He points out that in true typhus man is principally involved, whereas in other typhus-like fevers man is only occasionally involved.

OCHI (p. 792) describes a method for staining Rickettsia in sections, which cannot be further abstracted.

Vaccination.

PARROT (p. 368) differentiates between true immunity, in which, as in scarlet fever, the organism disappears completely from the body, but immunity remains, and premunition in which there is protection so long as living organisms remain, as in syphilis. In the latter the reticulo-endothelial system is involved. The proof of the existence of premunition is detection of the parasite in the resistant body. This is difficult in rickettsial diseases but may be accomplished (1) by inoculation of blood into susceptible animals, (2) by the feeding of vectors on animals, or (3) by splenectomy or reticulo-endothelial blockage followed by relapses. By these methods certain rickettsial diseases have been shown to produce premunition and by analogy it is suggested that certain diseases of the typhus group may do the same. Since, therefore, the presence of living organisms is necessary for protection

* The information from which this series of summaries has been compiled is given in the abstracts made by the Sectional Editors in the *Tropical Diseases Bulletin*, 1938, Vol. 35. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

in diseases giving rise to premunition, vaccines for typhus must be prepared with living virus. In non-epidemic periods, it is possible that some interference with the reticulo-endothelial system in persons in whom the virus is latent may result in parasitic relapse with infection of lice, thus forming a starting point for an epidemic outbreak.

For the culture of typhus Rickettsia ZINSSER *et al.* (p. 363) used 4 per cent. agar with equal volume of double strength Tyrode solution, to which 50 per cent. horse serum had been added. Growth appeared on the slope in 6 days. Later (p. 784) they employed a modified agar medium (*q.v.*) with mouse embryo tissue for the culture of Rickettsia. These cultures can be used for the preparation of vaccines. BENGTSON (p. 373) prefers Baker's solution to Tyrode's solution in Maitland's medium for the cultivation of the Rickettsia of Rocky Mountain fever [*R. rickettsii*]. She subcultured successfully for 14 generations and 81 per cent. of animals inoculated from time to time reacted to the virus. There was no loss of virulence. The Rickettsia were seen in the cytoplasm, but not in the nuclei, of the cells. Similar success was obtained (p. 363) with the viruses of endemic and epidemic typhus. BARYKINE *et al.* (p. 784) inject infective material into the yolk of eggs near the embryo and incubate at 32°C. Large amounts of virus are obtained.

In the *Bulletin of the Health Organisation* (League of Nations) (p. 357) are set down the findings of a Committee engaged on the consideration of vaccination against typhus. Living vaccines confer earlier and greater protection than killed vaccines and should be used in the presence of an epidemic. In a country free from the disease, however, it is wiser to avoid the introduction of living virus, and killed vaccines should therefore be used if prophylaxis is considered necessary. Standard methods of lousing should be organized and carried out vigorously.

A considerable fall in the mortality rate of Rocky Mountain fever in the north-western United States in recent years is attributed by HAMPTON and EUBANK (p. 800) to the extensive use of vaccine.

In experiments on guineapigs NOURY (p. 370) found that killed vaccine gave no protection against typhus.

In Tunisia, LAIGRET *et al.* (p. 794) used a living vaccine of endemic typhus virus dried and suspended in egg yolk and finally in olive oil. In 30,000 persons vaccinated in 1936 in areas where typhus existed, only 3 cases occurred in that year and none in 1937, though cases were found in the non-vaccinated. The three measures taken were isolation, lousing of contacts, and vaccination, the advantage of the latter being that normal life can be continued. SCHÄFER (p. 370) obtained good protection in mice with 2 doses of living virus emulsified in egg yolk and in oil. Dried vaccine similarly emulsified was not nearly so effective.

The Weigl killed vaccine prepared from lice was used near Lwow and RADLO (p. 793) states that about 90 lice intestines are prepared for each person, given in 2 or 3 doses. To check an epidemic it is enough to vaccinate 30 per cent. of the population.

BLANC and BALTAZARD (p. 364) found that faeces of fleas infected with murine virus, carefully dried *in vacuo*, may be infective for 100 days. Four volunteers were immunized by a vaccine of such faeces treated with bile. GAUD (p. 793) shows that after an extensive campaign of vaccination against typhus by the method of Blanc the number of cases of typhus, which had assumed epidemic proportions,

in N. Africa was greatly reduced. No severe reactions were seen. BONJEAN and NAIN (p. 368) found positive Weil-Felix reactions in 96 of 111 persons recently vaccinated against typhus with bile-treated vaccine.

CASTANEDA (p. 369) found that the phenomenon previously observed by ZINSSER and himself, that irradiation of infected rats produced large numbers of rickettsial bodies in the peritoneal fluid from which vaccines could be prepared, does not occur if the rats are kept at over 38°C.

BENGTSON (p. 374) prepared a vaccine, to which was added formalin in the proportion of 0·1 per cent., from cultures in modified Maitland's medium. This proved effective in guineapigs.

KLIGLER and LEVINE (p. 795) use two-week-old tissue cultures of typhus Rickettsia, triturated and suspended in saline and formolized, for vaccination. Monkeys and laboratory workers developed positive Weil-Felix reactions after vaccination, without discomfort or rise of temperature.

Proteus OX19 type. Vectors: louse and flea.

Having previously isolated *Proteus X19* from the blood of 50 per cent. of patients in a small outbreak of typhus, SPARROW and ROUSSEL (p. 367) repeated the attempt and succeeded in only 2·8 per cent. of 309 Weil-Felix positive bloods. They also isolated the same organism from 6 per cent. of 100 bloods from patients with fevers other than typhus.

GIROUD and TANNENBAUM (pp. 368 and 792) show that Proteus, though common in the intestine of man and rabbits, is not found in guineapigs and that the latter do not give positive Weil-Felix reactions on infection with typhus, but do so if Proteus has previously been introduced into the alimentary canal. They suggest that the Weil-Felix reaction is due to the passage of Proteus into the blood during an attack of fever.

Although mice may be easily infected by large intraperitoneal doses of the virus of endemic typhus, OKAMOTO (p. 370) found that with the same technique only 2 of 412 mice showed Rickettsia when the virus of epidemic typhus was used.

By inoculating dilutions of emulsions of organs of animals infected with typhus into the skin of rabbits, GIROUD (p. 791) showed that the tunica, which gives a nodule in dilutions up to 1/2000, contains 10 times more virus than other organs. Cultured virus gave less marked reactions than passage virus.

BALTAZARD (p. 795) quotes the work of NICOLLE to show that typhus virus mixed with immune serum does not infect, and shows that when treated with bile the viruses of murine typhus and boutonneuse fever fail to provoke local reactions. In researches on sera from persons with Rocky Mountain fever and typhus, conducted with murine and boutonneuse viruses, he has found that the serum of persons or animals cured of typhus or murine typhus prevents local reaction by murine virus, and that serum from boutonneuse and Rocky Mountain fever prevents local reaction by boutonneuse virus. GIROUD (p. 790, 791) shows that serum from patients recently recovered from typhus, mixed with the virus for 30 minutes, prevents reaction on injection into the skin of the rabbit. Normal serum does not. This test may be used to demonstrate antibodies in the blood. On the other hand, he shows (p. 791) that serum from persons who have received inoculations

of killed virus not only does not prevent reaction when mixed with living virus and injected, but also leads to a more severe reaction than is found with normal serum. WEIGL (p. 795) however states that the serum of convalescents if mixed with virus can prevent infection in animals. The serum of recently vaccinated persons is equally effective and if given together with vaccine during the incubation period of typhus, fever is prevented and immunity due to the vaccine is developed. Contacts may be protected in the same way.

GEAR and BECKER (p. 787) describe in detail the course of a case of typhus accidentally acquired in a laboratory. The incubation period was one week, the rash appeared on the 5th day of fever, there was a crisis on the 13th day, leucopenia was present and the Weil-Felix reaction was positive to *Proteus OX19* only. There was no true primary sore as in tick bite fever.

WU and ZIA (p. 785) conclude that there are two types of Rickettsia in Peiping, one resembling the endemic type and giving scrotal swellings in guineapigs, the other resembling the epidemic type with which these swellings do not occur, but which regularly produces typhus nodules in the brains. Complete cross immunity was found between the former and the Mexican strain, but not between the epidemic type and the Mexican strain. DELBOVE and NGUYEN-VAN-HUONG (p. 364) showed that two strains isolated from rats in Saigon produced fever and (in half the tests) scrotal reactions in guineapigs. By cross immunity tests it was found that 3 strains were immunologically identical with the Peking strain of epidemic typhus. Between 8 and 9 per cent. of the sera of 1,015 rats gave positive Weil-Felix reactions, mostly with *Proteus OX19*, but some with *OXK*. The percentage rose to 20 in June and fell to 6 in April and May.

Of 50,000 patients in Peiping in recent years, 450 were diagnosed as suffering from typhus and in a high proportion the serum agglutinated *Proteus OX19* in a dilution of 1,280. Typhus nodules in the brains of 10 studied by CHUNG and CHANG (p. 783) were numerous. One case is reported in detail. The Weil-Felix reaction was positive for *Proteus OX19* 1 in 1,280, guineapigs inoculated with blood developed fever but no orchitis, body lice injected into guineapigs produced fever, clean lice fed on the patient were heavily infected with Rickettsia and produced fever in guineapigs, and Rickettsia were found within the cells of lice intrarectally infected with guineapig brain emulsion. These findings point to true epidemic typhus.

RAYNAL (p. 781) shows that louse-borne relapsing fever is common in Shanghai and reports 14 cases of typhus with positive reaction to *Proteus OX19*. These are also probably louse-borne.

DRBOHLAV (p. 781) describes the measures taken against typhus in Czechoslovakia. APPEL (p. 799) points out procedures whereby notification, disinfection and isolation can be more effectively carried out than at present in the department of Constantine. These cannot be further abstracted. CHI and SU (p. 799) describe a simple hot air delousing box in which lice and nits can be killed in 20 minutes.

GRAY *et al.* (p. 788) describe the first case of sporadic typhus in Bristol for 10 years. Serum agglutinated *Proteus OX19* but not *OXK*. No virus could be isolated from rats captured near the man's work place, a mill. In the *Irish Journal of Medical Science* (p. 366) is a record of a man diagnosed as suffering from typhus in Cork city. The Weil-Felix reaction was negative on 3 occasions but clinical evidence

was convincing. Typhus has not been recorded for 8 years, but may exist in the rat population still.

Le Chuiton *et al.* (p. 782), on the assumption that the virus of murine typhus was present on bread contaminated with the urine of rats in ships in Toulon harbour, and that outbreaks among members of the crews were due to this fact, caused the bread, which had previously been left exposed on the 'tween decks, to be carefully stored and found that the numbers of cases of the disease fell from 34 in 1935 to only 4 in 1937 [see Violle below].

Modinos (p. 360) describes a case of murine typhus in Egypt in which agglutination of *Proteus X19* was present and blood produced fever and orchitis in a guineapig. An animal previously inoculated with a known typhus virus was found to be immune to blood from this patient. Cases of true typhus and boutonneuse fever are also described. Near Tunis Durand (p. 360) discovered a patient with murine typhus. The virus produced fever and orchitis in guineapigs and there was cross immunity between this virus and that of true typhus and that of murine typhus, but not with the virus of boutonneuse fever. Agglutination of *Proteus OX19* took place at 1 in 16,000 dilution.

Durieux and Arquié (p. 361) show that murine typhus may be a fatal disease and record one death in 4 cases occurring in Dakar. *Proteus OX19* was agglutinated at 1 in 500 dilution and fever and orchitis produced in guineapigs.

Two cases giving positive reactions with *Proteus X19* are recorded by Montrestruc *et al.* (p. 362) from Martinique. A single case of typhus in which *Proteus OX19* and *OX2* were agglutinated is reported by Gosden (p. 361) from Trinidad. No others have been reported for many years.

Hsieh *et al.* (p. 362) report 14 cases of typhus from Changsha. All recovered and were probably of the murine type.

In the *Public Health Notes*, Adelaide (p. 363) it is stated that endemic typhus in South Australia is the same as that found elsewhere, but it has not yet been possible to isolate the virus.

Gouriou *et al.* (p. 789) report phlebitis of the leg in a patient with endemic typhus. This has not been recorded before, though it occurs in boutonneuse fever.

With the virus of murine typhus Giroud (p. 796) found that in mice, rats, guineapigs and rabbits general susceptibility is inversely proportional to local reaction. This may be shown in tabular form :—

	General susceptibility	Local reaction
Mice ...	High fever ...	Nil
Rats ...	Fever not so high	Nil
Guineapigs ...	Mild fever ...	Definite
Rabbits ...	Not apparent ...	Marked

Kasahara *et al.* (p. 784) filtered tissue cultures and emulsions of organs from guineapigs infected with murine typhus through Berkefeld filters and demonstrated Rickettsia in smears from the tunica of guineapigs inoculated with material from rabbits which had received injections of the filtrate.

Blanc and Baltazard (p. 785) found that the minimum infective dose of murine typhus virus in louse faeces was at least 100 times greater for the guineapig than for man.

Riding (p. 360) has isolated a virus obtained from the brains of 4 wild rats caught near Cairo. Fever and orchitis were produced in guineapigs and infected rabbits developed positive Weil-Felix reactions. Zwierz (p. 786) found that 16 per cent. of the sera of rats from endemic typhus areas in Poland gave positive Weil-Felix reactions. The virus gave fever but no orchitis in guineapigs.

In the southern United States, Brigham and Dyer (p. 782) have found opossums, field mice, rats and the flying squirrel to be susceptible to the virus of endemic typhus. They isolated it from one field mouse.

Violle (p. 786) shows that young pigs can be infected by ingestion of the virus of murine typhus and of boutonneuse fever, the latter producing a rash ; and (p. 371) records the infection of a young pig with the virus of endemic typhus, with the development of a macular rash which became petechial. Violle and Sautet (p. 786) failed to transmit murine typhus to rats by the bite of *Triatoma infestans* but succeeded when the bugs were crushed and ingested by the rats. Violle (p. 372) infected a dog by feeding with the brain of a guineapig infected with murine typhus. The Weil-Felix reaction was negative but the blood of the dog was infective. He suggests that infection may be conveyed to man by food contaminated with the urine of rats [see Le Chuiton *et al.*, above]. He considers that the wild rabbit may be a reservoir of this virus. Intradermal injection of small doses of virus into rats and guineapigs is useful in rapid diagnosis.

Noting that guineapigs receiving the virus of Tunisian murine typhus by instillation on to the conjunctiva acquire immunity though no severe infection results, Sparrow and Mareschal (p. 794) applied the same technique to 5 men. All developed mild fever, without rash, in 15 days the Weil-Felix reaction became positive and all were proved to be immune.

Proteus OXK type. Vector : mite.

Twenty cases of scrub typhus, mostly positive to *Proteus OXK* and negative to *OX19* are reported from plantations in Cambodia by Delbove *et al.* (p. 780). All occurred in male coolies engaged in clearing scrub and in the rainy season when the rodent population was driven by floods to the high ground where the men were working. Alain and Delbove (p. 781) record 4 cases of fever which they regard as closely allied to Japanese river fever observed in Indo-China. Three gave positive reactions with *Proteus OXK*, all showed primary sores and generalized maculo-papular rash. Guineapigs inoculated from one developed fever but no scrotal reaction.

Kapila and Maitra (p. 359) describe a patient in India with severe fever, enlarged glands and a rash. The Weil-Felix reaction for *Proteus OXK* was positive on the 15th day.

Shortt (p. 779) reports that 66 of 134 squirrels in Madras gave positive Weil-Felix reactions with *Proteus OXK* from 1/25 to 1/200 dilution. No positive results were obtained from the examination of ectoparasites or from 90 bandicoots.

Vaucel and Bruneau (p. 368) cultivated 22 strains of Proteus from the blood of 288 rats in Hanoi. Only one was fully identified as *Proteus OXK*.

KAWAMURA *et al.* (p. 374) have used the virus of the mild form of tsutsugamushi fever seen in the Pescadores for fever therapy in the treatment of nervous diseases. Symptoms produced were slight, and 8 days later inoculation of the potent Japanese virus resulted in a mild reaction only. There was slight improvement in the mental condition.

RAGIOT *et al.* (p. 788) note that although there are two clinical types of typhus in Indo-China, one with rash and primary sore and one without, the viruses of the two types are apparently identical, resembling those of Rocky Mountain and São Paulo fever, and producing agglutinins to *Proteus OXK* but not *OX19*. Guineapigs inoculated with the virus of scrub typhus isolated in Saigon by DELBOVE and NGUYEN-VAN-HUONG (p. 785) showed results resembling those produced by Rocky Mountain fever rather than by tsutsugamushi fever, and were not rendered immune to the Peking typhus virus.

In the Simla hills there occur two waves of typhus. One in winter in which sera agglutinate *Proteus OX19*, and one in August-October in which sera agglutinate *Proteus OXK*. SMITH and MEHTA (p. 358) investigated the serological reactions of 1,212 wild rats caught from May to February and found a marked increase in *OXK* agglutinins from October to December. No result was obtained in attempts to infect guineapigs from two rats which showed high reactions to *OXK*, by means of mites, fleas, ticks or injections of emulsified brain and spleen tissue. Ticks and mites failed to transmit the *OX19* virus, but fleas (*N. simla*) fed on the same infected animals and injected into guineapigs produced orchitis and in rabbits agglutinins for *OX19*. Virus of the *OX19* type was isolated from fleas on rats during the time when the *OXK* type of fever was common, but no *OXK* virus was recovered.

MEHTA (p. 358) found that in the Simla hills the flea population of rodents was lowest in the cold weather when the maximum number of murine typhus cases (*OX19*) occurs, but fleas, lice and ticks are at a maximum in August to October when *OXK* cases occur. He suggests that larval mites and Hyalomma may transmit the rural (*OXK*) type.

YACOB (p. 359) describes an outbreak of typhus-like fever, with primary necrotic sore, enlarged glands and definite rash, in the Punjab. The Weil-Felix reaction for *Proteus OX19* was positive in 6 of 7 patients tested, but in low dilutions only.

HASSETT (p. 359) records a severe case in India, with symptoms of meningitis, in which agglutinins for *Proteus OX19* and *OX2* were found in 1 in 1,000 dilution.

Indeterminate type. Vector: *tick.*

CUMMING (p. 779) shows that cases of typhus in the United States varied from 300 in 1931 to 1,662 in 1936, and that increasing numbers are being reported from rural areas, with new reservoirs found in mice, rats, marmots and squirrels.

CAREY and DUNCAN (p. 801) describe a case of Rocky Mountain fever in eastern U.S.A. There was high fever, a macular rash and agglutination of *Proteus OX19*. In the *Health News*, New York (p. 801) it is reported that 4 further cases of Rocky Mountain fever have occurred in Long Island, all giving reactions to *Proteus OX19*.

An outbreak of spotted fever in Columbia is reported by PATINO *et al.* (p. 361). Of 63 persons attacked 60 died. Blood from 7 patients produced fever in guineapigs and Rickettsia were found in cells in the peritoneal fluid, and similar results were obtained by injecting emulsified

head lice from the patients, though those from normal persons produced no reaction. Weil-Felix reactions with *Proteus OX19, OX2* and *OXK* were all negative. In view of the evident house infection the authors suggest that a tick of the genus Ornithodorus may have been the vector.

PARKER (p. 800) shows that *D. variabilis* is the vector of Rocky Mountain fever in eastern U.S.A., and *D. andersoni* in the north-western states. A mild type of the virus may be found in *H. leporis palustris*, the common rabbit tick, which does not bite man.

In Brazil, DIAS (p. 801) shows that though the dog is the principal reservoir host of spotted fever (including Rocky Mountain, São Paulo and Minas Geraes types), the opossum and wild rabbit are also affected. The commonest tick vectors are *Amblyomma cajennense* and *A. striatum*, and *R. sanguineus* may accidentally infect man as it is a common vector in dogs. TRAVASSOS (p. 365) believes that the opossum *Didelphis aurita* is a reservoir of São Paulo typhus. He succeeded in infecting several and found "typhus nodules" in the blood vessels of various organs though the animals were not ill. The virus could be passaged through the animals in series and was found in several opossums caught near São Paulo. The virus is transmissible by *Amblyomma cajennense* and in rabbits produces agglutinins for *Proteus OX19*. He (p. 797) obtained evidence of the transmission of the São Paulo virus in guineapigs by various stages of *Amblyomma striatum*. He also (p. 798) found that these ticks, collected from dogs, were naturally infected and could transmit the disease by bite. *A. brasiliense* is also capable of transmitting the virus.

Rickettsia rickettsii has a characteristic morphology and multiplies in the cytoplasm of smooth muscle cells and of blood-vessel walls; it proliferates in the nuclei of cells in mammalian tissue culture. Non-pathogenic Rickettsia are found in ticks and PINKERTON and HASS (p. 372), investigating the differentiation, found that the latter are not seen within the cell nuclei, nor are they pathogenic. They conclude from a large series of examinations that morphological appearances are not diagnostic and that the only unequivocal differentiation is the intranuclear occurrence of *R. rickettsii*. The non-pathogenic organisms are common in certain cells of the salivary glands of the ticks but do not produce massive invasion of the tissues generally, as is the case with *R. rickettsii*.

TRAVASSOS (p. 786) maintains the virus of São Paulo typhus in white rats by injecting 1 or 2 cc. of normal guineapig blood intra-peritoneally 3 or 4 days after the rat is infected. He (p. 797) shows that the virus of São Paulo typhus multiplies in white rats, though no lesions are found. The rats are strongly resistant to the virus and reduce its virulence on passage.

Although horses were apparently infected with living Mexican typhus virus, CASTANEDA and VARGAS-CURIEL (p. 797) failed to obtain a potent antiserum from them. They propose to super-immunize horses by intensive intravenous injections of formolized Rickettsia.

BLANC and BALTAZARD (p. 371) failed to infect a series of guineapigs, monkeys and men, who had previously been inoculated with or had suffered from boutonneuse fever or had received living bile-treated vaccine, with either the homologous virus or that of Rocky Mountain fever.

Violle (p. 789) shows that the viruses of boutonneuse fever and ship typhus cannot always be separated even by cross immunity tests and that the effects of inoculation in rabbits are similar. By ingestion, pups can be infected with the endemic typhus virus and rats with the boutonneuse fever virus.

Noury (p. 364) has preserved the virus of boutonneuse fever by the inoculation of an emulsion of the swollen tunica, suprarenal glands and spleen intraperitoneally into guineapigs, repeating the subinoculations every 5 days. Reactions have remained uniform for more than one year, with orchitis on the 3rd or 4th day and a rise of temperature immediately following this. Recovered guineapigs are immune to the virus of Rocky Mountain fever. The virus can also be preserved for some months by placing dead infected guineapigs in the ice chest.

Logothetis *et al.* (p. 790) show that virus from a patient with boutonneuse fever, heated to 56°C. for 30 minutes, produced no reaction in the patient on intradermal injection, but provoked a reaction in a normal person; when mixed with the patient's serum, an emulsion of infected guineapig brain produced no results in animals, but with normal serum gave a reaction. Ticks from the patient's house were infective.

Although blocking of the reticulo-endothelial system by colloids results in increase of severity of subsequently induced epidemic typhus in guineapigs, Noury (p. 798) found that with endemic typhus and boutonneuse fever it resulted in inapparent infection with subsequent immunity.

Olmer and Olmer (p. 788) record a case of boutonneuse fever occurring in Marseilles in winter, which is unusual.

The development of a primary sore on the eyelid, with involvement of the corresponding glands, in a woman who, in crushing a tick from a cat received a splash in her eye, is recorded by Aubaret (p. 367). A rash typical of boutonneuse fever developed.

Blanc *et al.* (p. 780) report two cases of typical boutonneuse fever contracted in West Africa from a tick-infested dog brought from Marseilles.

In Senegal, Peltier *et al.* (p. 780) report a patient whose symptoms were those of boutonneuse fever, with the exception that there was no *tache noire*, and whose serum agglutinated *Proteus OX19* 1/500 and *OX2* 1/2000. (The reactions of two endemic typhus patients, on the other hand, were *OX19* 1/50,000 and *OX2* 1/200.) Animals inoculated developed slight fever without orchitis and a pet dog belonging to the patient was infested with Rhipicephalus and had never been away from Senegal.

Germain and Morvan (p. 782) report from Lorient a fever of the typhus group with rash and serum positive to *Proteus OX2* and *OX19*, but without primary sore. Hitherto no case of boutonneuse fever has been reported from the Atlantic coast of France.

Raybaud (p. 367) has observed that a *tache noire* typical of boutonneuse fever may occur with fever but without rash. He (p. 789) reports a case of boutonneuse fever without rash but with primary sore.

Gear and Douthwaite (p. 787) isolated a strain of tick typhus from a dog tick, *Haemaphysalis leachi* in South Africa and conclude that this tick is the vector of that disease. *C. Wilcocks.*

MALARIA.

Précis of Abstracts in this Section.

Boyd (p. 808) reviews the present state of malaria prevention and control and concludes that for success control should not be a campaign, but a long term programme utilizing measures of the highest degree of permanence.

Sweet (p. 808) describes the three types of irrigation systems in Mysore State in relation to malaria. Minor irrigation from local tanks where water is scarce and therefore carefully conserved causes little malaria, large irrigation projects from greater tanks which seldom or never go dry are frequently malarious, while extensive river irrigation covering a large acreage with a perennial water supply is invariably highly malarious.

Schwetz (p. 808) reports the finding of *P. ovale* and of schizonts of *P. falciparum* in native children suffering from afebrile endemic malaria in Central Africa, and Shieber (p. 809) the finding of *P. ovale* in a patient in Palestine.

Giglioli (p. 809), writing of malaria on the Coast-Land of British Guiana, states that *A. darlingi* (not previously recognized there) is the main carrier of malaria in the Colony.

Boyd and Matthews (p. 809) report that, following natural inoculation with massive doses of sporozoites of *P. falciparum*, parasites were first detectable microscopically in the blood of a negro patient on the 10th day, and that in a series of individuals subinoculated daily with blood from this first patient, the seventh individual of the series was the first in whom parasites could be detected and in him the parasites were not found until the 8th day following subinoculation.

Toumanoff (p. 810) discusses the possibility of malaria of buffaloes falsifying the oöcyst and sporozoite indices of Anopheles in Indo-China.

Shute and Ungureanu (p. 810) have investigated the longevity of races of *A. maculipennis* and from their observations are led to believe that the average *atroparvus* remains infective longer than the average *messeae*.

Kitchen (p. 811) examined the mature and immature erythrocytes in *P. falciparum* and *P. malariae* infections and found that *falciparum* appears to be indifferent to the age of the erythrocytes it invades, while *malariae* favours mature erythrocytes.

Boyd and Kitchen (p. 811) have examined the skin and subcutaneous tissue at the sites of infected mosquito bites. Their findings do not suggest that the lymph passages are the normal route by which the majority of sporozoites reach their destination.

Manceaux (p. 812) has studied the leucocyte formula of acute malaria patients and notes that the changes in it are remarkably constant.

Chessa (p. 813) records his observations on 21 patients suffering from malaria with special reference to suprarenal function, and summarizes the literature on the subject. Pizzillo (p. 813) reports on a patient in whom reactivation of malaria with pernicious symptoms was observed during intravenous adrenalin treatment. Marañon (p. 814) discusses the literature of cases with symptoms of Addison's disease in which malaria appeared to be the aetiological factor.

Proske and Watson (p. 813), subscribing to the view that Henry's reaction is brought about by an increase in serum euglobulin, have

therefore devised a protein-tyrosin reaction for the quantitative estimation of euglobulin as a diagnostic test for malaria.

Durand (p. 814), reporting on the treatment with various sulphonamide derivatives of 36 patients suffering from either *vivax* or *falciparum* malaria, concludes that the action of these drugs is not regularly effective enough for them to replace quinine or the usual antimalaria synthetic products, though their antimalaria activity warrants further research on these lines. Coggeshall (p. 824) has studied the therapeutic effect of sulphanilamide on *P. knowlesi* infections in *rhesus* monkeys and concludes that this drug completely eradicates infection in the cases treated and that subsequent reinoculation reveals the existence of a residual immunity which may last for three months.

Lataste *et al.* (p. 815, 816) describe a method for estimating quinacrine (the French equivalent of atebrin) in the blood. They have used this method to ascertain the repartition of quinacrine between red cells and plasma and the relationship between the blood concentration and urinary excretion of quinacrine.

Kikuth (p. 816) discusses the chemotherapy of malaria on the basis of recent knowledge of the parasites.

Mollaret and Schneider (p. 817) have studied the action of rhodoprequine on the schizonts of *P. vivax*.

Decourt (p. 818) discusses the principle on which antiplasmodial measures should be based.

Canet (p. 818) elaborates the general conclusions drawn from a 4-years' experience of mass prophylactic administration of quinacrine on the rubber plantations in the red-soil belt of Northern Cochin-China.

Clark and Komp (p. 819) report on the 8th year's observations on malaria in Panama with the object of evolving a method of malaria control applicable to a native population of tropical America where antimosquito measures cannot be used.

Hackett *et al.* (p. 820) write on the nature, applicability and limitations of " naturalistic " measures of anopheline control, the purpose of their report being to systematize existing knowledge.

Mulligan and Afridi (p. 821) record the general principles which should be observed to obviate the creation of malarious conditions during engineering constructional works in India. Jandolo (p. 821) deals with bonification in respect of malaria in Italy.

Eaton (p. 821) shows that a soluble malaria antigen occurs in the serum of monkeys with acute *P. knowlesi* infection. This antigen when injected into normal monkeys gives rise to complement fixation antibodies similar to those produced by malaria infection, but no protective or agglutinating antibodies are formed.

Tupa and Ciuca (p. 822) have studied the histopathological lesions in experimental *P. knowlesi* infections in *M. rhesus* and conclude that this infection is associated with a hypertrophy of the reticulo-endothelial system in those organs where infective red corpuscles come into contact with the histiocytes.

Afridi (p. 823) has made observations on the extra-abdominal spleen (*i.e.*, the spleen transplanted to the surface of the *pectoralis abdominalis* muscle and left lying between this and the skin) in monkeys infected with *P. cynomolgi* and *P. knowlesi*. In *cynomolgi* infection the chief enlargement of the spleen occurred after the parasites had reached their peak, while in *knowlesi* infection the maximum enlargement occurred before the height of the infection.

Ciuca *et al.* (p. 823) have studied the mechanism of immunity acquired in intentional infections of general paralytics with *P. knowlesi*. It would seem that after recovery from the *P. knowlesi* infection there is a definite immunity independent of a premunition.

R. L. S.

Boyd (Mark F.). **Malaria : Retrospect and Prospect.**—*Amer. Jl. Trop. Med.* 1939. Jan. Vol. 19. No. 1. pp. 1–6.

This is a presidential address : it is a brief review of the present state of malaria prevention and control. Except in the field of epidemiology the application of the discoveries of Laveran and Ross has not yielded results commensurate with the importance of these discoveries or the importance of malaria. The reasons for this are discussed. " Malaria control should not be a campaign, it should be a long term program." " With the means at present available we will more economically utilize our resources, more quickly achieve our goal, and more firmly hold our position by the employment of the practices with the highest degree of permanency. We should ' build out ' malaria."

Norman White.

Sweet (W. C.). **Irrigation and Malaria.**—Reprinted from *Proc. Nat. Inst. Sciences of India.* 1938. Vol. 4. No. 2. pp. 185–189.

There are three types of irrigation in Mysore. Minor irrigation of small acreage from tanks, the water supply being dependent on rainfall, is associated with little or no malaria. Water is scarce and treated with respect. Larger irrigation projects from large tanks which never go dry and which distribute water through a system of canals are frequently associated with malaria of some severity. Extensive river irrigations with perennial water supply distributed by large canals and many miles of subsidiary channels are invariably responsible for much malaria. Spleen indexes of children of areas representative of these three types of irrigation are produced. Figures are also produced illustrating the increased mortality following the inauguration of river water irrigation following the construction of the Cauvery Dam and the Irwin Canal. Water was as usual supplied in excess and no provision was made for drainage. *N. W.*

Schwetz (J.). Sur quelques parasites rares trouvés dans le paludisme endémique des noirs de l'Afrique Centrale. (*Plasmodium ovale* et schizontes de *P. falciparum*.) [**Rare Parasites found in Endemic Malaria of Natives of Central Africa.**]—*Riv. di Malariologia.* Sez. I. 1938. Vol. 17. No. 6. pp. 431–437.

The author reports the finding of *P. ovale* in the blood of several native children in the Congo suffering from afebrile endemic malaria. The presence of schizonts of *P. falciparum* in the peripheral blood is generally associated with very acute cases. The author reports their presence in the blood of children in East and West Congo who were not suffering from fever and who, though heavily parasitized, were apparently well. *N. W.*

Shieber (Chaim). **The Presence of *Plasmodium ovale* in Palestine.**—*Harefuah.* Jerusalem. 1939. Apr. Vol. 16. No. 4 (94). [In Hebrew pp. 122–125. [11 refs.] English summary p. II.]

"A mixed infection of *Pl. vivax* and *Pl. ovale* was found in a patient living near Haifa.

"The *Pl. ovale* was typical in every respect and showed all the characters mentioned by Stephens in his original description.

"This is the first record of *Pl. ovale* acquired in Palestine."

Giglioli (George). **Malaria on the Coast-Land of British Guiana.**—*Health Conditions on the British Guiana Sugar Estates.* 1938. Nov. 21. Appendix I and II. pp. i–xxvi.

Three species of Anopheles are prevalent on the coast of British Guiana, *tarsimaculatus*, *albitarsis* and *darlingi*. Till recently the two latter species have been classified as a single species erroneously identified as *argyritarsis*, which apparently is not found on the coast. Of 13,000 Anopheles captured in houses, 88 per cent. were *darlingi*: of 2,000 captured in stables only 2·6 per cent. were *darlingi*. Both *tarsimaculatus* and *albitarsis* are zoophilic, whereas *darlingi* has a predilection for man. These and other considerations lead to the conclusion that *A. darlingi* is the only important vector. It breeds in bodies of water of considerable size: the water must have a low saline content and a neutral, or very slightly acid, reaction. Its breeding places are protected by vegetation affording shelter for the adult and some shade for the larva. It is a strict night flier: its dispersion and range of flight are favoured by high atmospheric humidity.

Between August and November 1937, 5,814 children under 12 years of age were examined on 15 estates. Spleen rates from zero to 60 per cent. were observed: the parasite rates ranged from 13·5 to 68·7 per cent. There was epidemic prevalence of malaria when the survey was made. In the positive films unidentified large ring forms were found in 42·8 per cent., *P. vivax* in 28·8, *P. falciparum* in 7·3, and *P. malariae* in 21·1 per cent.

Splenic enlargement is much more marked and persistent among East Indians than among negroes living under exactly similar conditions.

The incidence of malaria diminishes from west to east along the coast as does atmospheric humidity. The distribution of malaria and of *A. darlingi* are coextensive.

Epidemic conditions of 1937 and 1938 were in large part determined by excessive rainfall, which markedly increased breeding facilities for *A. darlingi* and provided the high atmospheric humidity favourable to this species. *N. W.*

Boyd (Mark F.) & Matthews (Choice B.). **An Observation on the Incubation Period of *Plasmodium falciparum*.**—*Amer. Jl. Trop. Med.* 1939. Jan. Vol. 19. No. 1. pp. 69–71.

A male negro patient for whom malaria therapy had been prescribed had 30 anophelines applied to him: 25 fed. Of these 25, sporozoites were found subsequently in the salivary gland of 21. Thereafter, 10 cc. of his blood was inoculated daily into one of a series of other susceptible patients until the 10th day when parasites were found in the blood and a clinical attack commenced. The seventh individual

of the series was the first in whom parasites could be detected : in him parasites were found on the 8th day following subinoculation and fever commenced on the 9th day. Very similar results have previously been reported by the first-named author in the case of *P. vivax* (see this *Bulletin*, 1935, Vol. 32, p. 405). *N. W.*

TOUMANOFF (C.). Le paludisme des buffles peut-il fausser les indices oocystiques et sporozoitiques en Indochine ? [**Can Malaria of Buffaloes falsify Oöcyst and Sporozoite Indexes in Indo-China ?**]—*Bull. Soc. Path. Exot.* 1939. Jan. 11. Vol. 32. No. 1. pp. 80–87. [11 refs.]

The author previously reported the persistence of malaria sporozoites in two *A. minimus* after the insects had fed several times on cattle [see this *Bulletin*, 1938, Vol. 35, p. 569]. In referring to that report BRUMPT put forward the hypothesis that the malaria of buffaloes might conceivably falsify the oöcyst and sporozoite indices of anopheline vectors in Indo-China. The present paper rebuts that hypothesis. *P. bubalis* has never yet been found in Indo-China. The evolution of malaria parasites in the malaria vectors of Indo-China (*minimus*, *jeyporiensis* and *hyrcanus*) is sometimes slower than is generally thought. It is consequently not very easy to determine the age of sporocysts from their morphological appearance. This tardy evolution is sometimes noted at high temperatures which are considered to be optima. The persistence of sporozoites in the two cases reported was connected with active sporocystic evolution in insects heavily infected on several occasions. It is possible that the specially slow evolution may be related to the absorption of animal blood by the infected insect, but this remains to be proved. *N. W.*

LEESON (H. S.). **Keys to the Known Larvae and Adults of West African Anopheline Mosquitoes.**—*Bull. Entom. Res.* 1939. Apr. Vol. 30. Pt. 1. pp. 129–161. With 36 figs.

SHUTE (P. G.) & UNGUREANU (E.). **Preliminary Report on the Longevity of the Races of** *Anopheles maculipennis*.—League of Nations. Health Organisation. Malaria Commission. Geneva. 1939. Feb. 21. C.H./Malaria/273. 11 mimeographed pp.

The authors study the proportion of mosquitoes (races of *A. maculipennis*) which survive under various experimental conditions and the proportion which might develop a salivary infection with Plasmodium.

It has been repeatedly found that *A. maculipennis atroparvus* lives well in captivity and that about 80 per cent. of a batch will survive long enough to show sporozoites in salivary glands. The races *typicus* and *messeae* give a high mortality in captivity.

In the simplest experiment here described twenty specimens of each of four races of *A. maculipennis* were kept at 24°C. and a relative humidity of 70–90 per cent. On the 11th day (the day on which sporozoites of *P. vivax* appeared in glands of *atroparvus*) 19 *atroparvus*, 14 *labranchiae*, 14 *typicus* and 10 *messeae* were alive. Six other experiments were carried out, under varying conditions of temperature and humidity, all but one in summer in Rumania. The proportion of *atroparvus* living long enough to become infective was consistently 85–100 per cent. ; the proportion of other races surviving long enough

was much lower (only 32 per cent. in *messeae*), but inconsistently so. The different races are not strictly comparable for all *atroparvus* were fertilized and laying eggs, but the others were not fertilized [and had therefore, presumably, a lower metabolic rate].

In one experiment bred females of *atroparvus* and *messeae* were fed on the same human patient. The results were :—

	atroparvus	*messeae*
Number of females fed ...	28	28
Positive sporozoites ...	22	17
Mean number of oöcysts...	61	15

The authors believe that the average *atroparvus* would have continued to be infective for a longer time than the average *messeae*.

P. A. Buxton.

Crawford (R.). **Some Anopheline Pupae of Malaya with a Note on Pupal Structure.**—110 pp. With 27 figs. Published by the Govt. of the Straits Settlements and the Malaria Advisory Board, F.M.S. 1938. Singapore. Govt. Printer.

Kitchen (S. F.). **The Infection of Mature and Immature Erythrocytes by *Plasmodium falciparum* and *Plasmodium malariae*.**—*Amer. Jl. Trop. Med.* 1939. Jan. Vol. 19. No. 1. pp. 47–62. With 5 figs. [10 refs.]

The author has previously reported the marked partiality of *P. vivax* for reticulocytes [see this *Bulletin*, 1939, Vol. 36, p. 138]. He now publishes the results of similar observations, using the same technique, of three patients suffering from typical clinical attacks of *falciparum* malaria, and of two patients with *malariae* infections. All were cases of induced malaria, two of the *falciparum* cases being infected by anophelines, the other and the two *malariae* cases by blood inoculation. The results are clearly set out in tables and graphs. The total numbers of mature red cells infected with *P. falciparum* constantly exceeded the total numbers of reticulocytes so infected. The two types of cell alternated irregularly in showing the higher percentage of infection. The stage of the disease did not appear to influence these variations. The incidence of infection of reticulocytes with *P. malariae* was very low : this parasite was absolutely and relatively much more frequent in mature erythrocytes. *N. W.*

Boyd (Mark F.) & Kitchen (S. F.). **The Demonstration of Sporozoites in Human Tissues.**—*Amer. Jl. Trop. Med.* 1939. Jan. Vol. 19. No. 1. pp. 27–31. With 4 figs. on 2 plates.

The skin and subcutaneous tissue about the site where a single infective mosquito was applied was removed under local anaesthesia as soon as possible after the removal of the mosquito. The tissue was sectioned and searched for sporozoites. Three cases are reported. In no case did excision prevent infection. In one case two typical unchanged sporozoites were seen in one section about 3 mm. from the

surface of the skin: they were extravascular and surrounded w extravasated blood.

In four other cases the site of mosquito inoculation was the ingu region: one or two of the larger adjacent lymph nodes were excised day following the application of the mosquitoes. Sections of glands were examined. In one case several sporozoites were obser all in connective tissue, none in lymphoid tissue. In no case did removal of glands have any effect on the subsequent infection. appearance of the sporozoites found in lymph nodes was unalte indicating that they had neither reached their destination nor achie their destiny. The finding does not suggest that the lymph pass are the route by which the majority of sporozoites travel to t destination. *N. W*

Parrot (L.), Catanei (A.), Ambialet (R.) & Clastrier Observations parasitologiques sur le paludisme en Algérie (R'c novembre 1934 mai 1936). [**Parasitological Observations Malaria in R'oufi, Algeria.**] —*Arch. Inst. Pasteur d'Algérie.* 1 Dec. Vol. 16. No. 4. pp. 459–485. With 6 diagrams.

This is a fuller account of work already reported and abstracte this *Bulletin*, 1939, Vol. 36, p. 388. *N. W*

Mancfaux (A.). La formule leucocytaire dans le paludisme a [**Leucocyte Formula in Acute Malaria.**] —*Bull. Soc. Path. E* 1939. Feb. 8. Vol. 32. No. 2. pp. 150–154.

The author has made a study of the leucocyte formula of a l number of patients suffering from acute malaria. Changes in it remarkably constant and correspond to the reaction of the orga to the infection. During the five days following the applicatio infected anophelines there is an increase of monocytes with appearance of Türck cells and Riéder cells. During the at there is an initial leucocytosis, with increase of neutro cells and mononuclears: this diminishes during the attack a replaced by mononuclear increase alone after the attack. several days, or several attacks, the initial moderate leucocyto sometimes replaced by slight leucopenia: polynuclear neutro diminish, commonly to 40 to 50 per cent.; polynuclear eosino commonly disappear; monocytes oscillate round 10 per cent., lymphocytes frequently amount to 40 to 50 per cent. With rece the formula gradually returns to normal, but monocytosis persist. This persistence indicates a still active reticulo-endotl system. A return of the formula to normal is a good test of cli recovery.

These changes in the leucocyte formula follow the fluctuations c serological index (melano-flocculation). Blood cholesterin falls rises with the number of polynuclear cells. The bilirubin in the l is increased, the increase tending to disappear when symp disappear, but increased blood bilirubrin like excess monocytes, for similar reasons, may persist. The return to normal lev bilirubin and monocytes is evidence of complete cure. *N.*

Chessa (Fausto). La funzionalità surrenale nella malaria. [**Function of the Suprarenals in Malaria.**]—*Riv. di Malariologia.* Sez. I. 1938. Vol. 17. No. 6. pp. 438–455. [46 refs.] French summary (5 lines).

An interesting summary of the literature of the subject is followed by notes of 21 patients suffering from malaria, both acute and chronic, including both *vivax* and *falciparum* infections, with special reference to suprarenal function. They each received an intravenous injection of insulin. Eight cases exhibited a hypersensibility to insulin, *i.e.* cases in which the fall in glycaemia following the injection exceeded 0·30 mgm., the glycaemia remaining below the pre-injection level for two hours. *N. W.*

Proske (H. O.) & Watson (Robert B.). **The Protein Tyrosin Reaction. A Biochemical Diagnostic Test for Malaria.**—*Public Health Rep.* 1939. Feb. 3. Vol. 54. No. 5. pp. 158–172. [40 refs.]

This paper opens with a survey of the literature of Henry's Reaction. The authors subscribe to the generally accepted opinion that that reaction is due to a disequilibrium of the serum proteins, characterized by an increase of the euglobulin fraction which flocculates upon dilution with distilled water or with weak salt solutions. If this be so, the quantitative chemical estimation of the euglobulins should give results similar to those of Henry's Reaction. A method has been devised for such an estimation ; this is described in detail.

A 14 per cent. solution of anhydrous sodium sulphate in distilled water is used to precipitate the euglobulins. Euglobulin like other proteins has chromogenic properties in the presence of a phenol reagent. The colour produced by the euglobulin in the sample is compared with that produced by standard solution of pure tyrosin (Pfanstiehl). The phenol reagent used is that of Folin and Ciocalteu. All glassware should be chemically clean ; the serum pipettes should have fine tips, and the serum should be clear.

As a result of the examination of over 2,000 normal blood sera, the authors have found that the tyrosin index for euglobulin fluctuates between 50 and 80 : for serum of malaria patients the index ranges from 80 to 280 or higher. The test was found to be indicative of malaria in 97·4 per cent. of known malaria cases, compared with 81·9 per cent. positive thick blood films examined at the same time. The test is of course no more specific than is Henry's Reaction, but it is very sensitive in malaria. The test is, moreover, relatively simple and needs no expensive apparatus, such as a photometer. *N. W.*

Pizzillo (Giuseppe). Sulla cura adrenalinica venosa nelle infezioni malariche. Nota XIII—Sindrome perniciosa da riattivazione. [**Reactivation of Malaria, with Pernicious Symptoms, during Intravenous Adrenalin Treatment.**]—*Riv. di Malariologia.* Sez. I. 1938. Vol. 17. No. 6. pp. 456–461. With 1 chart. German summary (3 lines).

A man aged 30 suffered from an acute attack of *falciparum* malaria in Italian East Africa. He was repatriated and suffered from a relapse during the voyage home. He was admitted to hospital, again suffering from fever, a month after his arrival in Italy. He was kept four days under observation without treatment. He had quotidian fever :

there were numerous *falciparum* parasites in his blood. On the 5th day adrenalin treatment was begun, the initial dose being 1/50 mgm., associated with quinine by mouth 1·20 gm. a day. On the second day of treatment the temperature fell to normal and the quinine was suspended. After the 15th daily injection of adrenalin, 1/10 mgm., fever returned and quinine was given. The fever was quotidian. During the third paroxysm the symptoms became grave, temperature 40·2, blood-stained bilious vomiting, delirium, diffuse abdominal pain, small frequent pulse, 160, and rapid superficial respiration. Quinine was given and the condition improved. The following day the adrenalin injection was followed by a return of the grave symptoms with diarrhoea. A second injection of adrenalin was given on that day and 0·5 gm. of quinine intramuscularly. Improvement followed. Injections of adrenalin, 1/10 mgm., were given twice daily and one gram of quinine intramuscularly, during the six days that the fever lasted. Thereafter adrenalin injections were given once a day till the end of the course of treatment. The patient made a complete recovery.

The appearance of pernicious symptoms for the first time during a relapse, three months after the primary attack in which grave symptoms did not appear, is of interest, as is also the apparent efficiency of adrenalin, in relatively large doses, in combating pernicious symptoms.

N. W.

Marañon (G.). A doença de Addison de origem paludica. [**Addison's Disease of Malarial Origin.**]—*Brasil-Medico.* 1939. Jan. Vol. 53. No. 5. pp. 93–95. [20 refs.]

A discussion of the literature of cases with symptoms of Addison's Disease in which malaria infection appeared to be the aetiological factor is followed by a description of two illustrative cases. They occurred in Spain ; both were *P. vivax* infections. The author concludes that the malaria parasite can produce symptoms of suprarenal insufficiency, and that in individuals with a constitutional predisposition this acute insufficiency can develop into a chronic condition, that is to say Addison's Disease. Such may occur in severe tropical infections as well as in benign tertian infections of Western Europe.

N. W.

Siegenbeek van Heukelom (A.). De behandeling van acute malaria : kinine of atebrine ? [**The Treatment of Acute Malaria. Quinine or Atebrin ?**]—*Nederl. Tijdschr. v. Geneesk.* 1939. Apr. 1. Vol. 83. No. 13. pp. 1447–1455.

i. Durand (Paul). Action des dérivés sulfamidés et sulfonés sur l'hématozoaire du paludisme. [**Action of Sulphonamide Derivatives on the Malaria Parasite.**]—*Arch. Inst. Pasteur de Tunis.* 1939. Mar. Vol. 28. No. 1. pp. 82–93.

ii. ——. Action des dérivés sulfamidés et sulfonés sur l'hématozoaire du paludisme.—*Bull. Soc. Path. Exot.* 1939. Mar. 8. Vol. 32. No. 3. pp. 286–290.

i. This is a report on the treatment of 36 patients suffering from either *vivax* or *falciparum* malaria with various sulphamide derivatives. The infections were in no case recent : the patients were suffering from relapses. The derivatives used were rubiazol (prontosil), septasine,

soluseptasine, rodilone, and septoplix (sulphanilamide). All of these preparations were ineffective in certain cases. In many cases fever was suppressed sufficiently rapidly but relapses were not rare; sometimes these occurred before the end of treatment. In half the cases action on schizonts was observed. Gametes, especially crescents, were more resistant. In two *vivax* cases treated with rodilone gametes disappeared while schizonts persisted. The author concludes that the action of these drugs is not regularly effective enough for them to replace quinine or the usual antimalaria synthetic products in the treatment of malaria, but the fact that they do at times possess antimalaria activity warrants a continuation of such observations, more especially if new derivatives should be produced.

ii. This appears to be a very similar account of the same cases.

N. W.

Lataste (C.), Nguyen-Van-Lien & Farinaud (M. E.). Recherche et dosage de la quinacrine dans le sang. [**Determination and Estimation of Quinacrine in the Blood.**]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 5. pp. 422–424.

The methods of Chopra and Roy and of Hecht did not permit the estimation of the very small amounts of quinacrine generally present in the blood of patients undergoing curative or preventive treatment. The authors' method is as follows. A large quantity of blood, 25 cc., is taken and an anticoagulant liquoïde [sodium polyanethol sulphonate, see this *Bulletin*, 1938, Vol. 35, p. 704, and *Bulletin of Hygiene*, 1938, Vol. 13, p. 663], 0·20 gm. per litre of blood, added. The blood is centrifuged for a considerable time in a tube graduated in tenths of a cc. The volume of the cells can be read directly.

To the sample to be examined is added an equal quantity of 60 per cent. pure potash rapidly liquefied in a water-bath at 100°C. The first extraction is done with Hecht's solvent, pure benzene free from thiophene 8 parts, amyl alcohol 2 parts. This takes up the blood pigments and the acridine. Prolonged shaking is followed by centrifuging. The solvent is pipetted off. The process is repeated, the washings being added to the solvent.

The total benzo-amylic extract is then treated with N/10 hydrochloric acid, first with 3 cc., then 2 cc. and finally 1 cc. decanting each time the aqueous solutions which are collected in a colourless tube of 10 to 12 mm. diameter. The blood pigments remain in the benzo-amylic fraction. After alkalinization the acridine is collected in a thin layer of amyl alcohol. This extract contains the whole of the quinacrine in the sample. It is compared in diffused light with standard dilutions of the drug similarly treated ranging from 0 to 50 γ by 2·5 γ gradations (γ=0·001 mgm.). By this method quantities as small as 1/10 mgm. of quinacrine per litre of blood can be estimated with an error not exceeding 10 to 15 per cent. [See also this *Bulletin*, 1938, Vol. 35, p. 569.] *N. W.*

Lataste (C.), Farinaud (M. E.) & Nguyen-Van-Lien. La répartition érythroplasmatique de la quinacrine. [**The Repartition of Quinacrine between Red Cells and Plasma.**]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 6. pp. 522–525.

Can an elective affinity of quinacrine for red cells explain the schizonticidal action of that drug? To answer this question the

authors, employing their method described above, examined a patient under treatment with quinacrine for two periods of five days each, with an interval of two weeks, 0·3 gm. a day. The first definite appearance of the drug in the blood occurred after a delay which may extend to 2 or 3 days from the beginning of treatment. The maximum concentration was found on the day following the administration of the last dose. The drug disappeared from the blood 5 or 6 days after the end of treatment. The total amount of quinacrine in the blood was but a fraction of the amount ingested, about 4 per cent. The drug had a very definite affinity for red cells: the amount of quinacrine recovered from red cells was three times greater than the amount recovered from the same volume of plasma. The fixation of quinacrine by red cells is not a vital phenomenon: it can be demonstrated *in vitro*. There is a relationship between the quantity of protein and the concentration of quinacrine. *N. W.*

Farinaud (E.), Lataste (C.), Baccialone (L.) & Canet (J.). Rapports entre la concentration sanguine et l'élimination urinaire de la quinacrine. [**Relationship between Blood Concentration and Urinary Excretion of Quinacrine.**]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 7. pp. 623–624.

The maximum concentration of quinacrine in the blood of Annamite patients, treated with 0·30 gm. a day for 5 days, varies between 0·60 and 1·50 mgm. [per litre]. In two patients the relationship between this concentration and the urinary excretion of the drug was studied. The urinary excretion reaches its maximum the day the last dose is taken: small quantities can be detected in the urine for a considerable time thereafter. If the treatment be then repeated the urinary elimination of the drug increases immediately after the first dose, indicating an accumulation of the drug in the organs. In one patient whose daily excretion of urine was 1,000 cc. the maximum daily elimination of quinacrine was 18 mgm., after a latent period of several days, and thereafter he continued to excrete 9 to 10 mgm. a day till the treatment was repeated. The second patient excreted from 1,500 to 2,000 cc. of urine a day: he began to excrete the drug after a shorter latent period, the maximum amount being 34 mgm. in 24 hours, and the residual elimination was at a rate of 5 mgm. a day. The maximum concentration of the drug in the blood for any given individual remains constant whatever the number and frequency of treatments. The saturation of the tissues that have accumulated the drug, resulting from a repetition of treatment, is evidenced by a sudden increase in the amount eliminated in the urine but not by any increase of the blood concentration of the drug above the maximum previously noted. *N. W.*

Kikuth (Walter). Die Chemotherapie der Malaria auf Grund neuer parasitologischer Erkenntnisse. [**The Chemotherapy of Malaria on the Basis of Recent Knowledge of the Parasites.**]—*Muench. Med. Woch.* 1939. Mar. 10. Vol. 86. No. 10. pp. 362–365.

Besides measures against mosquitoes, attempts have been made to interrupt the developmental cycle of malaria parasites in man and mosquitoes by means of drugs. Quinine and atebrin are effective clinically, while plasmoquine acts against the sexual forms in malignant

tertian malaria and prevents the fusion of male with female gametocytes, and also appears to be more efficient in preventing relapses.

Recently "Certuna" was introduced and is well tolerated, besides it does not give rise to methaemoglobin formation or secondary symptoms. It can prevent the exflagellation of male gametocytes, and is active against the gametocytes of malignant and benign tertian parasites. It possesses the novel property, when given in minimal doses, of arresting the development of the fertilized female at the oöcyst stage. It has no prophylactic action in induced human malaria.

So far, no causal prophylactic is known. A stage in development between sporozoites and intracellular forms has been suggested to explain long incubation periods and the inactivity of drugs in general, as well as relapses. In the case of paralytics inoculated with blood, a small dose of drug, on the other hand, gives rise to cure as the intermediate stage of the parasite is here probably absent.

The first positive discovery of the possible intermediate stage was made with *P. elongatum*. Later with the same parasite, pigmentless forms were demonstrated in endothelial cells and subsequently for *P. gallinaceum* and *P. cathemerium*. The author considers that these unpigmented forms are part of the developmental cycle of the parasite. As with sporozoites these forms are not affected by known drugs in the same way as intracellular forms, but plasmoquine may be an exceptional drug, as the author's researches indicate.

Endothelial forms have been noted in the bone marrow of an African monkey and reported likewise for malignant and benign tertian malaria in man, following sternal puncture at the end of the incubation period subsequent to sporozoite infection. The forms are similar to those found in bird malaria. The verification of these findings will help to clarify some nebulous points in the epidemiology of malaria and assist in further chemotherapeutical progress. *J. D. Fulton.*

Mollaret (P.) & Schneider (J.). Contribution à l'étude de la paludothérapie action d'un médicament gaméticide dans le paludisme thérapeutique. [**Contribution to the Study of the Anti-Malarial Activity of a Gametocide in Malaria Therapy.**]—*Bull. Soc. Path. Exot.* 1939. Feb. 8. Vol. 32. No. 2. pp. 207–221. With 8 figs.

This concerns the action of rhodoprequine, 0·03 gm. a day for 3 days, on the schizonts of *P. vivax*. The interesting observations recorded were all made on patients undergoing malaria therapy. The strain of *P. vivax* used has special characteristics. It has been transferred direct from patient to patient for ten years and has assumed the attributes of a fixed virus. Its incubation period has been reduced to 7 days; this period is not further reduced by intravenous injection. It is generally administered subcutaneously or intramuscularly. The interval between attacks of fever has been reduced from 48 to 42 hours. The febrile reaction is intense. The parasite density in the blood is small. The strain is extremely sensitive to quinine.

The authors have shown that rhodoprequine in the doses mentioned above, in addition to its recognized gametocide action, has a certain action on the schizonts of this strain. Its administration is followed, after a delayed final attack, by a cessation of fever, and the disappearance from the blood of both gametocytes and schizonts. If

subsequently an auto-haemo-injection be given attacks of fever recommence and parasites reappear in the blood after an interval of from four hours to four days. These reappeared parasites are well developed forms ; the schizonts show no tendency to segment or to leave the red cell (Decourt's dysgonic action). If blood containing such forms be inoculated into another subject the schizogonic capacity of the parasites is regained. The inhibition of schizogony determined by rhodoprequine does not prevent the further development of gametes. *N. W.*

Decourt (Ph.). La lutte antiplasmodiale. Son application dans la pratique. [**Anti-Malaria Measures : their Practical Application.**] —*Bull. Soc. Path. Exot.* 1939. Jan. 11. Vol. 32. No. 1. pp. 69–80.

Malaria prevailing in such varying conditions it is impossible to establish a standard method of antiplasmodial activity that is generally applicable. With this fact in mind, the author proceeds to discuss the principles on which successful measures should be based. A study of the local problem is the first essential, parasitology and morbidity, anophelism and human geography. Splenic, splenometric and parasite indexes should not be confined to the child population : adults should receive similar attention. The incidence of febrile attacks, mortality, still-births, and the effects of morbidity on the social and economic life of the community, all call for study. Serometric indices give valuable information as to the immunity of the community.

Collective prophylaxis with synthetic drugs involves the use of quinacrine and rhodoprequine, or the association of the two, premaline : of these quinacrine is fundamental. A fixed daily dose of quinacrine should be used, the rhythm of administration varying with circumstances. Thus it may be advisable to administer the drug three times the first week, then weekly, and subsequently increasing the intervals to ten days and finally twice monthly. If a large proportion of the population are submitted to treatment and if there is not free communication with other malarial communities that are not being treated, there are great advantages in associating a gametocide with quinacrine : the administration of the drugs can be spaced out to a greater degree and more quickly than if quinacrine be used alone. If antiplasmodial measures are applied on a sufficiently large scale administration of drugs twice a month should be considered the normal rhythm. Examples are given of very varied conditions that called for equally varying treatment. *N. W.*

Canet (J.). Note sur les résultats obtenus au cours de quatre années de prophylaxie collective antipaludique par médicaments synthétiques sur les plantations des Terres Rouges (Nord Cochinchine). [**Results of Four Years Mass Prophylaxis with Synthetic Drugs in Plantations in North Cochin-China.**]—*Bull. Soc. Path. Exot.* 1939. Jan. 11. Vol. 32. No. 1. pp. 58–69.

This paper elaborates the general conclusions derived from four years' experience of the prophylactic administration of quinacrine in the rubber plantations in the red-soil belt of northern Cochin-China, where malaria is persistently hyperendemic. The severity of the malaria is directly conditioned by the presence and prevalence of

A. minimus: this is very little subject to seasonal variations. From the end of March to the middle of June and again in October and November there is some mitigation of the severity of the disease but only in the former period is the improvement sufficiently well marked to allow of temporary suspension or diminution of drug prophylaxis. It is recognized that in a hyperendemic region such as this the administration of drugs should never be regarded as the sole method of permanent prophylaxis, excellent though the temporary results may be. Antilarval measures and improvement of the social life should go hand in hand with drug administration, the latter being only an adjuvant.

The populations treated are subject to discipline and control, an essential condition for successful drug prophylaxis. The drug was taken in the presence of the doctor in charge, or of another European. Many thousands of coolies have been treated with quinacrine, but no untoward results have been noted; discolouration of the skin has been exceptional and there has been no repugnance towards the drug such as was commonly evidenced to quinine. Synthetic remedies are undoubtedly more effective than quinine. A serious outbreak can be suppressed almost immediately by the administration to a village population of quinacrine, 0·30 gm. a day, adult dose, for three or five days: examples are given. The working capacity of a labour force can thus be quickly regained, but after a few weeks conditions relapse to their former severity in the absence of a follow-up treatment. For such continuous treatment the daily dose used was the same, 0·30 gm. The frequency of the distribution varied with local conditions, the chief of which is the degree of prevalence of *A. minimus*. Any standard treatment is a heresy. In general, administration once a week was found necessary and sufficient. The arrival of heavily infected contingents of labourers, a cold spell, specially arduous labour, or other adverse conditions sometimes necessitate more frequent administration, every five days, or even every three days. Experience has not shown that the association of a gametocide with quinacrine, in collective prophylaxis in such hyperendemic areas, serves any useful social or economic purpose. *N. W.*

Clark (H. C.) & Komp (W. H. W.). **An Eighth Year's Observations on Malaria in Panama.**—*Amer. Jl. Trop. Med.* 1939. Jan. Vol. 19. No. 1. pp. 33–46.

As explained in previous reports of this series the main object of these studies is to evolve a method of malaria control applicable to a native population of tropical America where antimosquito measures cannot be used. Early attempts at eradicating the "seed-bed" of infection, gametocytes in young children and adolescents, with drugs at present available, had failed. Not all carriers of infection can be reached, and in a large number of cases no drug or combination of drugs can eradicate infection. The treatment of sub-clinical cases may destroy a certain amount of immunity. Drug control methods failed to control the cyclical epidemic of malaria that occurred in Panama in 1935. The present progress report contains nothing to modify these conclusions. In the year under review, 1937–38, one group was treated with atebrin 0·1 gm. thrice daily for 5 days, followed by plasmoquine 0·01 gm. twice daily for five days. Another group was treated with quinine sulphate 15 grains daily for 5 days followed by

plasmoquine 0·01 gm. twice a day for five days. The treatment was given to all parasite carriers discovered at monthly surveys. Both methods appeared to be equally effective. The parasite rates were the lowest yet recorded: a normal decline and treatment both contributed to this. Of individuals examined in all twelve-monthly surveys, 36·8 per cent. had parasites in their blood as compared with 43·5 in 1936–37. *P. falciparum* was found in 75 per cent. of the positive films. Only one infant under one year of age out of 53 examined was found infected. The method adopted has almost abolished clinical illness from malaria but the disease has not been eradicated. A rise in clinical malaria and in the general infection rate is expected when the overdue peak of the malaria curve occurs. In Panama transmission can occur throughout the year. Parasite rates are not related to rainfall. *N. W.*

Hackett (L. W.), Russell (P. F.), Scharff (J. W.) & White (R. Senior). **The Present Use of Naturalistic Measures in the Control of Malaria.**—*Bull. Health Organisation.* (League of Nations.) 1938. Dec. Vol. 7. No. 6. pp. 1016–1064. With 13 figs. [42 refs.]

In this useful report the authors consider the nature, applicability and limitations of "naturalistic" methods of anopheline control and the results obtained thereby in many lands. Naturalistic measures are defined as "deliberate extensions or intensifications of those natural processes which tend to limit the production of mosquitoes or their contact with man." These measures are classified as chemical, physical and biological. The chemical measures against aquatic stages of the mosquito are pollution of water and changing salt content of water. The physical measures are natural fills, warping, silting; sluicing; flooding; fluctuating water level; intermittent drying; agitating; stagnating (ponding) or setting water in motion; muddying; shading or clearing; and drying by planting. The biological measures are natural enemies (predators); changing flora and fauna; and off-season attack. In addition naturalistic measures against adult mosquitoes are referred to: chemical, creating repellent barriers of odorous plants; and administering drugs like sulphur which cause odorous perspiration; physical, destruction of shelters, clearing; creation of plant barriers to flight; and rendering bedrooms or dwellings unattractive as resting places: biological, introduction of natural enemies; deviation by animals; and winter killing. Of these naturalistic measures against adult mosquitoes only animal deviation needs serious consideration.

No new facts are reported, the purpose of the paper being to systematize existing knowledge. In doing this the authors have rendered useful service. Many of these measures are important because of their potential adaptability to rural areas where other methods of mosquito control have been impossible. Further progress requires increased knowledge of mosquito ecology: this calls for co-operation of medical malariologist, biologist, chemist, engineer and agronomist. Rural malaria is closely connected with agriculture and pisciculture. Measures that have already achieved success in certain areas and have possibilities of more general application include herbage packing, sluicing, shading, and the use of exotic fish like Gambusia. Some naturalistic methods offer the advantage of a combined attack on more

than one vulnerable point in the biology of the larva. Herbage cover pollutes water, shades it and may obstruct egg laying mechanically; salinification may destroy larval food as well as larvae; shading may limit egg laying or larval growth or inhibit sheltering algae. Photographs illustrating successful application of some of these methods add interest to the paper. *N. W.*

Mulligan (H. W.) & Afridi (M. K.). **The Prevention of Malaria incidental to Engineering Construction.**—*Health Bull. No. 25. Malaria Bureau No. 12.* pp. ii+52. With 8 photos on 4 plates & 11 figs. (6 folding). 1938. Delhi: Manager of Publications. [7 annas or 8d.]

"The object of this Bulletin is to record in simple language the general principles which should be observed during construction works of various kinds so as to obviate the creation of conditions which will subsequently produce mosquitoes and malaria." These opening words of the pamphlet adequately describe its scope. It is well done. There is obviously no scope for originality in the compilation of a work of this kind, but had the precautions, which are clearly outlined, been taken in the past the benefits conferred by engineering achievement would not have had to be offset by increased prevalence of malaria. Works of this kind should lessen the probability of future neglect in this important matter. *N. W.*

Gabaldon (Arnoldo). Generalidades sobre malaria y organización de la lucha antimalarica en Venezuela. [**Malaria and Anti-Malarial Measures in Venezuela.**]—*Bol. Ministerio de Sanidad y Asistencia Social.* Caracas. 1939. Jan. Vol. 4. No. 1. pp. 69–76. With 4 graphs & 2 figs.

[See this *Bulletin*, 1939, Vol. 36, p. 91.]

Jandolo (Eliseo). Gli indirizzi della bonifica integrale nei rapporti con la malaria in Italia. [**Bonification in Respect of Malaria in Italy.**]—*Riv. di Malariologia.* Sez. I. 1938. Vol. 17. No. 6. pp. 462–474. English summary (7 lines).

This paper was presented to the International Malaria Congress at Amsterdam. It describes the development of complete bonification schemes, recent legislation on the subject, and the remarkable results following the reclamation and intensive cultivation of malaria-stricken areas in Italy. *N. W.*

Eaton (Monroe D.). **The Soluble Malarial Antigen in the Serum of Monkeys infected with** *Plasmodium knowlesi.*—*Jl. Experim. Med.* 1939. Apr. 1. Vol. 69. No. 4. pp. 517–532. With 3 figs. [10 refs.]

It has been shown that the serum of monkeys suffering from severe acute *Plasmodium knowlesi* infections contains a soluble antigen which in the presence of immune serum from hyper-immunized monkeys gives a strong complement fixation reaction. The titre of the antigen is related to the extent of the infection during its acute phase. Intravenous injection of the serum containing the antigen into monkeys causes the production of specific complement-fixing antibodies which

react with the serum antigen as well as with an antigen extracted from parasitized cells. As monkeys immunized with the serum antigen were in no way immune to infection, there exists the possibility that the serum antigen was the product of the destruction of red cells. As the sera of certain monkeys and human beings infected with *P. knowlesi* give little reaction with the serum antigen and a stronger one with antigen prepared from parasitized cells it would appear that another complement-fixing antigen is present in these cells. This soluble serum antigen is not excreted in the urine, is labile to acids and alkalis, resists a temperature of 56°C. and is precipitated for the most part in the albumin fraction by ammonium sulphate.

C. M. Wenyon.

Tupa (A.) & Ciuca (M.), with the collaboration of G. Badenski & P. Ionescu. Contribution à l'étude des lésions histopathologiques dans l'infection expérimentale du *M. rhesus* au *Pl. knowlesi*. [**Histopathological Lesions in Experimental** *P. knowlesi* **Infection in** *M. rhesus*.]—*Arch. Roumaines Path. Expérim. et Microbiol.* Paris. 1938. Mar. Vol. 11. No. 1. pp. 39–84. With 33 figs. (17 coloured) on 17 plates. [107 refs.]

During the past three years in Rumania amongst other malarial studies the authors have investigated *Plasmodium knowlesi* infections in monkeys. The organs of a number of these animals which died of acute malaria or were killed at the height of their infection were utilized for histological studies. The results are carefully described in this paper, which is illustrated by a series of 17 excellent plates, 9 of which are in colour. The general conclusion reached is that the malarial infection in the monkeys is associated with an hypertrophy of the reticulo-endothelial system in those organs where the infected red blood corpuscles come into close contact with the histiocytes. This occurs chiefly in the spleen and liver and to a much less extent in the bone marrow. Even in the spleen it is chiefly in the cords of Billroth that the reaction occurs. It is much less marked in the venous sinuses. Where the hyperplasia occurs the histiocytes detach themselves and become free in the blood stream where they are carried to other organs and to the lungs. It is remarkable that the blood of the right heart contains a much larger number of these cells carrying the products of their phagocytosis than the blood of the left heart.

A point which is specially emphasized is the behaviour of the lymphoid follicles of the spleen. It is maintained that the lymphocytes do not become transformed into macrophages and that in those cases in which evidence of phagocytosis in the follicles is obtained, it is carried out by certain histiocytes which are there and not by modified lymphocytes. The general tendency is for the lymphoid follicles to degenerate, the surviving lymphocytes taking up a peripheral position. The lymphatic glands themselves behave in a similar manner and do not contribute to the defensive process. Similarly in the endocrine glands the histiocytes which do not come into intimate contact with the blood fail to respond. Haemoglobinuria being a feature of monkey malaria, the opportunity was taken of making a special study of the kidneys. The damage caused to the renal tubules and glomeruli are carefully described and illustrated. In general, this is comparable to what occurs in human blackwater fever.

The investigation has been very carefully carried out and the paper should be studied by all those who are interested in the cellular reactions of malarial infections. *C. M. W.*

Afridi (M. K.). **Observations on Extra-Abdominal Spleen in Monkeys Infected with** *P. cynomolgi* **and** *P. knowlesi*.—*Jl. Malaria Inst. of India.* 1938. Dec. Vol. 1. No. 4. pp. 355–389. With 7 charts. [21 refs.]

By a surgical procedure the spleen of a number of rhesus monkeys was moved through an abdominal opening to a position on the pectoralis abdominalis muscle where it was allowed to remain in a subcutaneous situation. When the monkeys had recovered they were inoculated with either *Plasmodium knowlesi* or *P. cynomolgi*. Observations were made on the increase in size of the spleen and the development of the parasites both in the peripheral blood and in blood taken from the spleen by puncture. In the case of *P. cynomolgi* infections the chief enlargement of the spleen occurred one to four days after the parasites had reached their peak and had commenced to decline. Similarly when a relapse took place though parasites were few in number a considerable degree of splenomegaly occurred. In the case of *P. knowlesi* infections the maximum enlargement of the spleen occurs before the height of the infection, at which time a decrease in size may occur. In the case of *P. cynomolgi* at the time of the crisis there is a marked irregularity in the cycle of development. The rate of increase in the number of parasites during the early stages of a *P. knowlesi* infection in some cases appears to be greater than can be accounted for by the number of merozoites produced. This phenomenon is discussed without any explanation being offered. In the case of both parasites at the time of the crisis, abnormally small schizonts are liable to appear. Peripheral blood and spleen puncture blood were examined every two hours, and it was found in the case of *P. knowlesi* infection that the peripheral blood was two hours behind that of the spleen as regards the number and stages of development of the parasites. There was thus a lag of two to four hours between the splenic and the peripheral blood. *C. M. W.*

Ciuca (M.), Badenski (G.), Ionescu (P.) & Teriteanu (E.). Contribution à l'étude du mécanisme de l'immunité acquise dans l'infection intentionnellement provoquée par le *Plasmodium knowlesi* chez l'homme. [**Mechanism of the Immunity acquired in the Intentional Infection of Man with** *P. knowlesi*.]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 34. pp. 1234–1236.

For the treatment of general paralytics the authors have employed the monkey malarial parasite *Plasmodium knowlesi*. It was observed that the majority of the patients after recovery from the malarial infection resisted entirely a second inoculation. In order to determine whether this was due to premunition or not two of these immune subjects were inoculated with a large dose of heavily infected blood. At intervals of 6, 12, 34, 48 hours and 7 days, 10 cc. of blood was taken and inoculated into susceptible monkeys. Only those receiving the blood taken after 6 hours became infected, a result which proved that the inoculated parasites disappeared from the blood in between 6 and 12

hours. It would seem that after recovery from a *P. knowlesi* infection there is a definite immunity independent of a premunition.

C. M. W.

COGGESHALL (L. T.). **The Cure of *Plasmodium knowlesi* Malaria in Rhesus Monkeys with Sulfanilamide and their Susceptibility to Re-infection.**—*Amer. Jl. Trop Med.* 1938. Nov. Vol. 18. No. 6. pp. 715–721.

The author, who has already published an account of experiments on the therapeutic effect of sulphanilamide on *Plasmodium knowlesi* infections in rhesus monkeys [this *Bulletin*, 1938, Vol. 35, p. 897], in this paper describes further tests with this drug. In this case nine monkeys were used and treatment was commenced on the 4th to the 168th day of infection, parasites being demonstrable in the blood in all cases. In all cases, the minimum dose being a single one of 1·0 gram given to one monkey, parasites disappeared from the blood and daily examinations over a long period failed to indicate any relapse, such as is frequent after quinine or atebrin treatment. As a further confirmation of cure blood was taken from the apparently cured animals and inoculated into clean monkeys. This again failed to reveal any latent infection, though it is known that a single infected red cell is capable of giving rise to an infection. Furthermore, some of the treated animals were splenectomized without any infection being aroused. It is concluded that sulphanilamide in the cases treated completely eradicated the infection. All nine monkeys were subsequently reinoculated. All became infected, but six recovered spontaneously, an unusual result which indicated the existence of a residual immunity which was present as long as three months after the sulphanilamide treatment. The marked effect of the drug on *P. knowlesi* is contrasted with its failure in 30 cases of human *P. vivax* infections, and in avian infections due to *P. lophuriae* and *P. cathemerium*. *C. M. W.*

HELMINTHIASIS.

Précis OF ABSTRACTS IN THIS SECTION.

LEATHERS, KELLER & MCPHAUL (p. 828) examined by the Stoll-Hausheer technique nearly 30,000 residents in 543 rural communities in Florida and found a percentage infected with hookworms varying between 23 and 50, and in some districts observed a heavy infection to as many as 5,000 ova per cubic centimetre of faeces. SEHEULT (p. 828) has reviewed the subject of hookworm infestation in Trinidad, dealing largely with its historical aspect. FERNANDO (p. 828) has done the same for Ceylon, but follows the historical introduction by recording the prevalence and importance of this infestation; in 1936 there were 1,839 deaths attributed to this cause and 258,720 cases were treated in the dispensaries. PEARSON & YANG (p. 829) from smear examination of a limited number of persons admitted to hospital, found about 1 in 5 to be infested with hookworms in Shaoyang, Hunan. Some

provinces in Somaliland have been thought to be free from ankylostomiasis, but MOISE (p. 829), in the course of examining by the Willis technique 423 persons who had been negative to another, found 45 per cent. positive and the relative proportions of *Necator* to *Ancylostoma* worms recovered about three to two. Infection by *Sch. haematobium* was present in the same district.

D'ANTONI & ODOM (p. 829) describe a filtration (sieving) method of obtaining ova of helminths and cysts of protozoa from faeces, and SAWITZ, TOBIE & KATZ (p. 830) have investigated the specific gravity of hookworm ova and find it to be for practical laboratory purposes approximately 1·055. DESCHIENS (p. 830) describes a simple paper cone trap for obtaining larvae from a faecal culture.

PEERY (p. 831) gives an interesting account of the post-mortem findings in three negroes dying after accidental poisoning by a mixture of carbon tetrachloride (1 part) and ethylene dichloride (3 parts); the one who lived longest had taken half a pint and died in 150 hours. FERNANDO and his colleagues (p. 832) deduce, after employing it in 41 adult persons with hookworm infestation, that tetrachlorethylene had no toxic effect on liver, kidneys, heart or lungs, but GUNEWARDENE (p. 832) stresses the dangers of using this drug if it has undergone chemical changes, for phosgene is one of the products. Symptoms of intoxication by this were pallor, shallow sighing respiration, dim vision, impaired speech and drowsiness.

GARIN & ROMAN (p. 833) rightly regard ankylostomiasis as an occupational disease among the miners in the Loire Valley and consider the question of prophylaxis on the usual lines of examination of workers [and prospective workers to prevent fresh introduction] and treatment by tetrachlorethylene of those found infested.

ROUBAUD & DESCHIENS (p. 833) record the interesting fact that certain fungi in their growth entangle and digest larvae of some species of nematodes, among them those of *A. duodenale*. This suggests the possibility of getting rid of infective larvae in the soil by seeding with these fungi, *e.g. Dactyella ellipsospora*.

OTTO & KERR (p. 833) record the results of their attempts at experimental immunization of dogs against *A. caninum* by subcutaneous injection of living larvae.

Filariasis.—DASSANAYAKE (p. 834) in a filariasis survey of Ceylon, of which he is M.O. in charge, found among 7,329 blood-smears taken between 9 p.m. and 1 a.m. a mean positive of 6·2 per cent. The proportions of *malayi* to *bancrofti* were four to one. "Galle leg" is the common name in Ceylon for elephantiasis there, but, although *bancrofti* is more common in Galle town, this condition is due to *malayi*. MITRA (p. 834) found a case of *W. bancrofti* infection in the Mikir Hills, whereas in the North Cachar Hills, about 100 miles further south, the prevalent Filaria is *malayi*. VAN BEUKERING (p. 834) makes an interesting observation: examination of Mentavei Islanders, in Sumatra, did not discover any infected with filaria; nevertheless he did find an *A. ludlowi* in the convict barracks infected. He, therefore, examined the blood of the convicts (86 in number) and found three positive. He infers that the mosquito acquired it from one of the convicts who had come from Bandjermasin district. OLIVER, A. G. & J. (p. 835) note that filariasis is decreasing among the military but not among the civilians in Porto Rico. Twelve per cent of the soldiers were positive when their bloods were examined in 1903, only 3·7 in 1932 and 2·5 in 1937. It might be present without any clinical

indication. Hu (p. 835) in a study of mosquito infection found that the length of survival of *Culex pipiens* was roughly inversely proportional to the severity of infection; this, however, was not without exceptions, since some, though but lightly infected, might succumb early. The same author observed that filaria larvae found difficulty in developing in this mosquito in Shanghai during the winter unless it was kept in an artificially warmed environment. He finds (p. 336) that *C. vagans* is a very suitable intermediate host of *W. bancrofti*. Yokogawa (p. 836, 837) discusses the mode of infection by and transmission of *W. bancrofti* and whether the mosquito is the only invertebrate host, and, as a result of experimental work carried out by Yoshino and himself, decided that *Pulex irritans* at all events plays no part in the life history. Galliard (p. 837) describes work on the biology of Mansonia. From the clinical aspect Meyers & Kouwenaar (p. 838) record swelling of the superficial lymphatic glands, especially those of the groin, persistent eosinophilia and, in two patients, asthma and haemorrhagic nephritis for which only a filarial infestation could be found to account, and Bonne (p. 838) records a similar case of otherwise unexplained hypereosinophilia. Makar (p. 838) gives an account of the clinical symptoms produced by intra-scrotal filariae in Egypt and the pathological changes to which their presence may give rise.

Poynton & Hodgkin (p. 839) describe two embryonic filariae from *Macaca irus*, one of which could not be distinguished from *Mf. malayi*; the other was probably not parasitic in man. Underwood & Harwood (p. 840) discuss the results of experimental transfusion of large numbers of embryos of *Dirofilaria immitis* into the veins of a dog and the length of their survival and place of deposition. It has been maintained that this nematode does not reach maturity in less than 8 months, but Augustine (p. 840) found the embryos in two pups of five months. Consequently, either the former dictum is incorrect or infection may occur before birth.

Molser (p. 841) expresses his belief that *Acanthocheilonema perstans* can cause disease since its presence was associated with fever to which no other cause could be assigned. [It will be remembered that by analogous argument sleeping sickness was for a time ascribed to *A. perstans*.]

In the *East African Medical Journal* appears an account of onchocerciasis in Equatorial Africa, dealing chiefly with its historical aspect. In it Hawking (p. 841) reports finding embryos of *Onchocerca volvulus* in 7 out of 52 prisoners in Kakamega, Kenya, examined for eye trouble and in 21 out of 23 natives taken at random in a hospital. Presence of onchocerciasis in the same district is also reported by Harley-Mason (p. 841). Gopsill (p. 841) records its presence in the Shire Highlands of Nyasaland, and of the rare finding of embryos in the blood of persons infected. Dubois *et al* (p. 842) mention the finding of *Mf. volvulus* and *Mf. streptocerca* in the Medjeje district of the Congo and consider the part they play in elephantiasis there. This is followed up in another paper by Dubois & Forro (p. 842) in which they conclude that *O. volvulus* aids in, but is not the primary cause of, elephantiasis in the Congo. Déjou (p. 842) places on record a case of suppuration of an Onchocerca cyst; after it was incised worms appeared on the dressing [no mention made of any concomitant bacterial infection]. The same author, in conjunction with Advier (p. 842) records a case of double infestation with *O. volvulus* and *Dracunculus medinensis*; five of the latter were present and

there was an acute arthritis associated with the former. HUARD (p. 843) notes a similar arthritis due to streptococci associated with guinea-worm.

GALLIARD (p. 843), basing his remarks on the morphological similarity between the Strongyloides from different animals, discusses the question whether there is more than one species. The importance of deciding this point lies in the possibility of man acquiring the parasite from several animals. DE PAULA E SILVA (p. 843) states that *Strongyloides stercoralis* is commonly present in greater numbers in the duodenum than lower down the bowel; hence the passage of a duodenal sound is a very helpful, perhaps the best, means of diagnosing this infestation. SIMPSON's paper (p. 844) on the success of treatment by iodine introduced by a duodenal tube adds support to this. The pathological findings in Strongyloidiasis are the subject of an article by TORRES & DE AZEVEDO (p. 844); they found in two autopsies that the larvae in the rhabditiform stage had entered the blood or lymph by penetrating the wall of the colon or had passed down Lieberkühn's glands to the underlying tissue. SCHENKEN & MOSS (p. 845) found a specimen of *Trichostrongylus colubriformis* in a human appendix, together with two Enterobius. The former, though common in sheep in America, has not previously been seen there in man.

According to CRAM & REARDON (p. 845) Enterobius infestation is common in Washington, D.C.—41 per cent. of over 2,000 persons examined—and is thus a public health problem of considerable importance. NOLAN & REARDON (p. 845) note the frequency of ova of this worm in the dust of rooms inhabited by infested persons, and that a large proportion of them are still viable; consequently airborn infection is likely. HAMBURGER (p. 846) calls attention to neuroses which may arise in a child and its parents if too much notice is taken of the presence of threadworms. WRIGHT and his colleagues (p. 846) have obtained success by treating Oxyuriasis with tetrachlorethylene, even with a single dose. HALL (p. 846) draws attention to the fact that in spite of all our knowledge of the life-history and modes of dealing with *Trichinella spiralis*, *Enterobius vermicularis* and *Entamoeba histolytica*, they are all unduly prevalent still in the United States and in fact show (the two former at least) little if any reduction in the last 40 years or so. HOOD & OLSON (p. 847) write of the prevalence of Trichiniasis in Chicago. BOZICEVICH (p. 847) pursuing his studies on the same parasite details the mode of preparation of antigen for use in the diagnosis of infection by it. It has proved useful in both intradermal and precipitin tests. MCNAUGHT (p. 848) describes a new clinical diagnostic sign of trichiniasis—"splinter haemorrhages" of the finger nails—which had been noted by BIGGS and BRUCK. [How far this is pathognomonic cannot be stated till more investigations have been carried out.] VAN SOMEREN (p. 849) details the blood pictures and marrow changes produced in experimental infestation of rats with Trichinella and discusses the different methods of treatment which have been suggested for trichiniasis.

Lastly, FOSTER & JOHNSON (p. 850) discuss the mode of acquirement of *Capillaria hepatica* by man. Several animals can serve as hosts and if the eggs are not destroyed by cooking, these animals, among which are the peccary, the red spider monkey and the white-faced monkey, when used for food may infect man. The presence of the ova in the faeces, however, is not proof of parasitism; they may have been ingested and passed through the alimentary canal unchanged.

H. H. S.

[In the *précis* of the paper on filariasis by O'Connor and Knott in this *Bulletin*, 1939, Vol. 36, p. 143, it is stated that " These did not support their former conclusions that parturition in the adults is simultaneous and occurs about noon." This is incorrect. The *précis* should read as follows:—" O'Connor and Knott (p. 151) describe the pathological appearances in an excised varicose groin gland. Though supporting the view that parturition in the adults is simultaneous, these appearances did not suggest that it always occurs about noon." *C. W.*]

Leathers (W. S.), Keller (A. E.) & McPhaul (W. A.). **An Investigation concerning the Status of Hookworm in Florida.**—*Amer. Jl. Hyg.* 1939. Jan. Vol. 29. No. 1. Sect. D. pp. 1–16. With 2 maps & 1 graph. [10 refs.]

During 1937 and 1938 faeces were collected from 29,064 white residents of 543 rural communities in 56 counties of Florida. The faeces were then " stored at 40°C. until ready to be examined " [an unusual step] the examination being by egg counts of 0·005 cc. of faeces suspended in 1 cc. of decinormal caustic soda solution, the Stoll-Hausheer technique.

The percentage found infected was 34·8, varying between 49·2 in the west, 38 in the north-east, 25·2 in the centre, and 23·3 in the south; though, throughout, the soil is favourable for development of hookworm larvae, the more extensive agriculture and fruit growing in the south has improved the economic state and sanitary cleanness of those living there. Among 27,043 examinations analysed for sex and age, the total, the male and the female percentages of infection were 34·4, 38·4 and 30·8; the peak of infection by age lay between 15 and 19 years being 44·7 in total, 51·5 in males and 37·7 in females, though in these last it was 37·8 from 5 to 9 and again from 10 to 14 years. In the 10,126 faeces found positive, the average number of eggs counted was 5,100 per cc. of faeces; in 36·6 per cent. of the positives, the egg count was 2,600 or more, the level at which it is believed symptoms are likely to be present. It is estimated on this basis that in Florida 142,253 white persons have hookworm infection and 51,000 have hookworm disease. It was once more the case that the more persons in a family there were with hookworm infection the higher was the egg count per person. Of 4,121 faecal specimens got from negroes, 19·9 per cent. were found positive with an average weight of infection of 1,800 eggs per cc.; the age distribution was much as that for whites, but the percentage who showed that egg count which is deemed sufficient to cause symptoms was a third of that shown by whites. *Clayton Lane.*

Seheult (R.). **A Historical Review of Ankylostomiasis in Trinidad.**—*Caribbean Med. Jl.* 1938. No. 1. pp. 46–54.

Fernando (P. B.). **Anchylostomiasis in Ceylon.**—*Jl. Ceylon Branch Brit. Med. Assoc.* 1938. Sept. Vol. 35. No. 5. pp. 365–376. With 2 charts.

After a historical survey the local importance of hookworm infection in Ceylon is stressed by the Registrar General's figures for 1936, namely 1,839 deaths, 14,693 cases treated in public hospitals, and 258,720 in

dispensaries. There follows consideration of symptoms, clinical pathology (though here eosinophilia seems to have dropped out of a table showing typical findings in this infection), diagnosis, treatment (where tetrachlorethylene is favoured and the importance of iron in defeating the anaemia is stressed) and prognosis with emphasis on the reticulocyte response. *C. L.*

Pearson (G. H.) & Yang (C. T.). **Hookworm in Shaoyang, Hunan.**—*Chinese Med. Jl.* 1938. Dec. Vol. 54. No. 6. pp. 574–578. With 1 map.

Of 556 persons admitted to the Methodist Hospital, Shaoyang, Hunan, in the first five months of 1938, 112, or 20·1 per cent., showed hookworm infection to a single smear. The authors have also analysed cases of infection from hospital returns for three previous years.

It is noted that this figure would obviously have been higher had concentration methods been employed. Of 374 cases of infection analysed for occupation nearly half were coolies or land workers; while 73·1 per cent. of infected were intimately connected with land. Of 404 cases analysed for sex, men represented 94·4 per cent. [Apparently most of those attending hospital were males.] It is urged that by Government order all faeces should be stored for two months before being used on the soil as fertilizer, not an impossible ideal since some farmers do so for their own purposes already. An easy way of getting a laugh from the farmer with his straitened means is to suggest that all working on the land should wear rubber boots.

C. L.

Moise (Regolo). Osservazioni sulle elmintiasi d'interesse epidemiologico in Somalia (1932–1937). [**Helminthiasis of Epidemiological Interest in Somaliland.**]—*Ann. di Med. Nav. e Colon.* 1938. Sept.–Oct. Vol. 44. No. 9/10. pp. 444–451. With 2 plates.

In 1933 there were examined 568 faeces in Provinces apparently free from hookworm infection. Of these 423 were examined by Willis's technique after having proved negative to ordinary examination, presumably by smear, and in 45 per cent. of them eggs were found. Of 75 infected, to whom carbon tetrachloride was given in unstated dose, 12 passed no worms, 46 passed fewer than 25, 12 passed 25 to 50, 4 passed 50 to 100, and 1 passed more than 100. Of 936 worms recovered 38 per cent. were ancylostomes and 62 per cent. necators. The word "anchilostoma" is used indifferently for hookworms in general or ancylostomes in particular. There are photographs showing familiar appearances of worms and sick.

Schistosomiasis was by *S. haematobium* but in addition to vesical infection, its typical eggs were found twice in the faeces. *C. L.*

d'Antoni (Joseph S.) & Odom (Vada). **A Supplementary Basic Technique for the Recovery of Protozoan Cysts and Helminth Eggs in Feces. (Preliminary Communication.)**—*Public Health Rep.* 1938. Dec. 16. Vol. 53. No. 50. pp. 2202–2204.

A modification of the technique described in this *Bulletin*, 1939, Vol. 36, p. 144.

It having been discovered that hookworm eggs were held back when a faecal suspension was strained through a metal sieve with

60 meshes to the linear inch, the original technique was modified so that the moist, washed, faecal residue on the sieve was used instead of the original faeces. It was found that the sieve itself has little or no effect on retarding hookworm eggs since by putting a patient on a low residue diet only 0·2 per cent. of eggs are held back, while " by adding gelatinous (*i.e.* adhesive) substances to the diet the percentage of eggs may be greatly increased ; by adding bran to the diet the percentage of eggs retained by the sieve reaches 4 per cent. In a normal diet the percentage of eggs remaining in the sieve is about 2·5 per cent."

[That hookworm eggs in watery suspension are themselves sticky was reported in 1908 by William Pepper, *Jl. Med. Res.* Boston. This stickiness was the basis of the reviewer's diagnostic method, levitation [this *Bulletin*, 1918, Vol. 12, p. 183 ; 1919, Vol. 13, p. 208]. The great loss of eggs on straining through a wire sieve with 100 meshes to the linear inch was pointed out by the reviewer in comparing the results got from the same evened faecal suspension without and after such sieving [this *Bulletin*, 1924, Vol. 21, p. 574 and *Trans. Roy. Soc. Trop. Med. & Hyg.*, 1924, Vol. 17, p. 417 (Table X) ; this *Bulletin*, 1929, Vol. 26, p. 605 and *Amer. Jl. Hyg.*, 1928, May, Supp. p. 33 (Table III)]. As compared with unstrained suspensions the strained ones showed respective losses in the three faecal specimens tested of 35, 54 and 60 per cent. of the eggs disclosed by the former ; but the former failed, often greatly, to show the real egg content of the suspensions, for the numbers collected from them were, respectively, only 91, 31 and 48 per cent. of those disclosed by D.C.F.F.] *C. L.*

Sawitz (Willi), Tobie (John E.) & Katz (Gertrud). **The Specific Gravity of Hookworm Eggs.**—*Amer. Jl. Trop. Med.* 1939. Mar. Vol. 19. No. 2. pp. 171–179. With 2 figs.

" 1. By the use of the zinc sulphate buoyancy method the specific gravity of living eggs of *Necator americanus* has been determined to be approximately 1·055.

" 2. Dead hookworm eggs show a variation in their specific gravity, probably due to the change in the permeability of the egg membrane.

" 3. Since the buoyancy method for the determination of the specific gravity of biological objects cannot avoid the possible interfering action of the chemical solution with the true density, the specific gravity of 1·055 for eggs of *Necator americanus* is considered valid only for practical laboratory purposes and is not necessarily an intrinsic property of hookworm eggs."

[It is sixteen years since the reviewer found that for the practical laboratory purpose of diagnosis by D.C.F. (*Trans. Roy. Soc. Trop. Med. & Hyg.*, 1923, Vol. 16, p. 274, Table V, and this *Bulletin*, 1923, Vol. 20, p. 947) a specific gravity of 1,150 was dependable for the floating of hookworm eggs while one of 1,100 was not.] *C. L.*

Deschiens (R.). Procédé simple de récolte des larves strongyloides de nématodes dans les coprocultures. [**Simple Method of collecting Strongyloid Larvae of Nematodes in Faecal Cultures.**]—*Bull. Soc. Path. Exot.* 1939. Feb. 8. Vol. 32. No. 2. pp. 165–169. With 4 figs.

The culture consists of faeces with an equal quantity of vegetable charcoal, animal charcoal, or wood ash incubated at 25°C. to 30°C., set

in a Petri dish. In its centre in a conical hollow is a cone of filter paper with 2 or 3 cc. of water in it, and this is the trap which the larvae reach. Evidently no attempt was made to discover its efficiency by comparing the number of larvae found in it with the number of eggs which had been present in the faeces. *A. duodenale* and *S. fülleborni* were the nematodes concerned. *C. L.*

PEERY (Thomas M.). **Carbon Tetrachloride Poisoning. A Study of Stages of Hepatic Damage and Repair in Man.**—*Arch. Pathology.* 1938. Nov. Vol. 26. No. 5. pp. 923–941. With 3 figs. [49 refs.]

Three negroes found, in 1935, a discarded tin of "roach poison," a mixture of carbon tetrachloride and ethylene dichloride in proportion of 1 to 3, and drank largely of it thinking it was alcohol, the quantity taken by two was unknown, that by the third who lived long enough in consciousness to be questioned was about half a pint; they died respectively 6 to 11, 63 to 68 and 150 hours after taking it.

There is first considered the literature dealing with poisoning in man and of experimental studies in animals, and then the symptoms and the lesions at autopsy. Case 1 was a negress of 65 who died in coma with blood-urea-nitrogen 44 mgm., creatinine 2·6 mgm., and sugar 237 mgm. to the 100 cc., and she had no lesions 2 days after death except scattered haemorrhages. Case 2 was a negro of 54, stuporous, with blood-stained vomit, blood-urea-nitrogen 63 mgm., creatinine 8·4, sugar 40 mgm. to the 100 cc., and muscular twitchings; autopsy immediately after death showed small haemorrhages particularly about the abdominal organs; the microscope showed in the liver necrosis mostly in the central lobular zone where liver cells were replaced by red blood cells, and where the reticulum fibres were disorganized; there was no evidence of regeneration such as mitosis or the formation of young bile ducts. In the kidneys the greatest damage was in the cells of the convoluted tubes which were greatly swollen with granular cytoplasm and cell membrane indefinite. The capsular space was lined with swollen cells and itself contained fat droplets and eosinophil granular material, which latter as well as red cells was present also in the lumen of the tubules. There was no tendency to form eosinophilic fibrils in the glomerulus as there is in glomerulonephritis. In the adrenals there was extreme vacuolation of some cells in the outer fascicular zone but no necrosis; in the pancreas interlobular haemorrhage obstructed small ducts and small zones of necrosis were apparently related to these. There were haemorrhages too in heart, lungs, spleen, small intestine and stomach, the last having superficial cellular necrosis. The third patient, aged 38, took, as noted, about half a pint and vomited copiously and intermittently with blood in the vomit; the liver's edge was 4 cm. below the rib margin, urea-nitrogen of the blood 54, creatinine 8·2, sugar 82, serum calcium 8 mgm. in 100 cc. of blood. At autopsy 12 hours after death there was jaundice, numerous haemorrhages, pneumonia in the lower lobes, syphilitic aortitis; the liver weighed 1,080 gm., and on section was jaundiced, soft and without normal structure; the kidneys weighed 225 gm. each. Microscopically the central parts of the lobules of the liver had only collapsed stroma with some lymphocytes and red cells, the peripheral parts had large cells with some mitosis and with bud-like tubular projections pointing towards the centre of the lobule; the

reticulum was condensed about the thickened central venule ; the kidneys showed rather more markedly the changes seen in case 2. It is pointed out that after poisoning by ethylene dichloride there has been moderate fatty degeneration of liver cells (but no necrosis), multiple haemorrhages, and necrosis and calcification of epithelium of renal tubules. *C. L.*

FERNANDO (P. B.), D'SILVA (Maurice), STORK (G. K. B.) & SINNATAMBY (Grace R.). **Tetrachlorethylene in the Treatment of Hookworm Disease, with Special Reference to Toxicity.**—*Indian Jl. Med. Res.* 1939. Jan. Vol. 26. No. 3. pp. 759–783. [19 refs.]

" Tetrachlorethylene, in view of its low toxicity and efficiency, is a very valuable drug in the mass treatment of anchylostomiasis."

The determining of the presence of eggs, and the counting of their numbers before and ten days after treatment by undisclosed technique, was the method used to test the efficacy of the drug. After being shaken up into a fine suspension in Mistura alba it was given to adults in doses of from 3 to 8 cc. in 41 cases, and the percentage of cures estimated in this way varied from 44·44 to 100 as the dose was increased. It is, however, laid down, as a prerequisite for assessing the value of an anthelmintic drug, that there must be known the numbers of worms originally harboured, those removed by treatment and those still present after it. [The first and third will be reliable only if there is a constant worm-egg ratio and the removal here reported by tetrachlorethylene of nearly 20 per cent. more ankylostomes from one patient than should have been there by the egg count is further evidence of the inconstancy of this ratio ; as to the second there was once more noted the complete disappearance of eggs from the faeces with no worms passed, the host having evidently at last fed on the worms that had for long fed on him.] After determining the icterus index, the van den Berg reaction, and the presence of bile salts, bile pigment and urobilin in the urine, and using the bromsulphalein, and the laevulose tolerance tests, it is concluded that the drug has no toxic effects on liver, kidneys, heart or lungs. Yet " a few of those who received doses of 6 cc. or more showed temporary untoward effects as of an overdose of a narcotic drug." " Children may be given tetrachlorethylene in doses of 4 to 5 times the age in minims."

C. L.

GUNEWARDENE (S. R.). **Decomposition of Tetrachlorethylene.**—*Jl. Ceylon Branch Brit. Med. Assoc.* 1939. Jan. Vol. 36. No. 1. pp. 22–24.

Quart bottles of tetrachlorethylene were noticed to fume when opened on receipt from the makers, and to have a pungent smell. The Government analyst reported phosgene present and none of the drug was administered, but earlier serious symptoms had followed administration of this drug in an estate with 250 labourers, fortunately none fatal. The symptoms were rapid small pulse with pallor, shallow and sighing respiration, indistinct speech, dimness of vision, and drowsiness.

C. L.

Garin (Ch.) & Roman. Prophylaxie de l'ankylostomose des mineurs dans le bassin de la Loire. [**Prophylaxis of Ankylostomiasis in Miners of the Loire Valley.**]—*Ann. d'Hyg. Pub., Indust. et Sociale.* 1939. Feb. Vol. 17. No. 2. pp. 56–66. [Refs. in footnotes.]

Ankylostomiasis in French miners is an occupational disease. Some of its symptoms and its life cycle are sketched. Prophylaxis should be by discovery and treatment of the infected ; for the former reliance being placed on a modified Telemann technique, for the latter on tetrachlorethylene. *C. L.*

Roubaud (Emile) & Deschiens (Robert). Capture de larves infectieuses de nématodes pathogènes par des champignons prédateurs du sol. [**The Capture of Infective Larvae of Pathogenic Nematodes by Predatory Soil Fungi.**]—*C. R. Acad. Sci.* 1939. Jan. 23. Vol. 208. No. 4. pp. 245–247.

Will it prove possible to destroy infective larvae of hookworms and strongyloides, present in and on the soil, by seeding this with certain microscopic fungi ?

This paper deals specially with the free living larvae of *Strongyloides fülleborni* from the chimpanzee and of *Ancylostoma duodenale* from man, while the fungi were of five species, *Dactylaria brochopaga, Dactylella bembicodes, Dactylella ellipsospora, Arthrobotrys oligospora* and *Stylopaga hadra.* Members of these genera produce, in the presence of these among other nematodes, structures of a strangling or glutinous nature which capture these nematodes by a sudden enlargement of the cells which come in contact with the worms and digest them in 36 to 48 hours. Although the diameter of these larvae is as much as eight times that of the mycelium, and though the strands of the latter may rarely be broken, the larvae do not escape digestion. *C. L.*

Roubaud (E.) & Deschiens (R.). Destruction de larves infectieuses d'ankylostomes et d'anguillules intestinales par *Dactylella ellipsospora.* [**Destruction of Infective Larvae of Ankylostomes and Strongyloides by** *D. ellipsospora.*]—*Bull. Soc. Path. Exot.* 1939. Feb. 8. Vol. 32. No. 2. pp. 160–165. With 5 figs. (4 on 2 plates).

Otto (G. F.) & Kerr (K. B.). **The Immunization of Dogs against Hookworm,** *Ancylostoma caninum,* **by Subcutaneous Injection of Graded Doses of Living Larvae.**—*Amer. Jl. Hyg.* 1939. Jan. Vol. 29. No. 1. Sect. D. pp. 25–45. With 4 graphs. [29 refs.]

Immunization was by bi-weekly hypodermic injection of living infective larvae of *A. caninum* in numbers increasing from 15 to as much as 60,000 with an infective dose of 120,000 to 200,000 five to seven months later. Before and during the period of experiment the faeces were watched by D.C.F. for the appearance of eggs, and these were numbered by the Stoll-Hausheer method. The immunized animals were killed on day 35, all but one of the non-immunized animals died before day 14.

" Three litters of dogs, a total of ten animals, were used to demonstrate the sharp difference between the active immunity to hookworm resulting from serial light infections and the partial refractoriness of mature dogs to initial infections. From 52 to 203 worms were recovered at autopsy from

actively immunized dogs given test doses of 120,000 to 200,000 larvae; whereas, the unprotected litter mates produced 1,263 to 31,200 worms. Furthermore, the unprotected animals, with one exception, succumbed to the test infections; whereas, the immunized animals were scarcely disturbed. In the discussion of these results and the previous work on dog hookworm it was concluded that there is nothing distinctive about the so-called age resistance but rather that maturity and generally good health are essential for the host to respond fully and quickly to the stimulus of invading worms, *i.e.*, actively to acquire immunity."

[The note that "immunized animals were scarcely disturbed" perhaps applies to clinical state, for in two immunized dogs the lungs were found almost solid with grey hepatization. The conclusion that maturity and general good health are essential for the host's proper response to infection is unlikely to apply to man in face of the findings as between white persons and negroes by LEATHERS, KELLER and MCPHAUL, see above, p. 824.] *C. L.*

MAUZÉ (J.). Considérations histo-pathologiques sur les lésions intestinales relevées dans un cas d'ankylostomiase du noir. [**Histo-pathology of the Intestinal Lesions of Ankylostomiasis.**]—*Bull. Soc. Path. Exot.* 1938. Dec. 14. Vol. 31. No. 10. pp. 919–921.

CHOW (C. Y.). Notes sur quelques nématodes de l'Indochine française. [**Nematodes of French Indo-China.**]—*Ann. Parasit. Humaine et Comparée.* 1939. Jan 1. Vol. 17. No. 1. pp. 21–31. With 2 figs.

DASSANAYAKE (W. L. P.). **A Note on Filariasis in the Southern Province, Ceylon, 1938.**—*Jl. Trop. Med. & Hyg.* 1939. Feb. 15. Vol. 42. No. 4. pp. 51–53.

This report of the Medical Officer in charge of the Filariasis Survey, Ceylon, covers 7,329 blood smears made in three Districts between 9 p.m. and 1 a.m.

The percentage of positive examinations was between 0·6 and 14, mean 6·2. Of the infections, 80 per cent. were with *Mf. malayi* and 20 per cent. with *Mf. bancrofti*. The Pistia plant and *Mansonia uniformis* are abundant where the infection is by Malayan filariasis, *Culex fatigans* carries the Bancroftian form which is prevalent in Galle town. So well known locally is the association of filariasis with this town that "Galle leg" is the name in Ceylon for elephantiasis of that limb; yet this is a lesion caused by the Malayan infection, which does not cause genital infections. *C. L.*

MITRA (P. N.). **Filariasis in the Mikir Hills.**—*Indian Med. Gaz.* 1938. Dec. Vol. 73. No. 12. p. 740. With 1 fig.

In the Mikir Hills, lying in the Districts of Sibsagar and Nowgong south of the Brahmaputra, the blood from one filarial patient was reported on in the School of Tropical Medicine, Calcutta, as containing embryos which appear to be *Mf. bancrofti*, whereas in the North Cachar Hills *Mf. malayi* prevails. *C. L.*

VAN BEUKERING (J. A.). Filarialarve in een *Anopheles ludlowi*. [**Filarial Larvae in** *Anopheles ludlowi*.]—*Geneesk. Tijdschr. v. Nederl. Indië.* 1939. May 2. Vol. 79. No. 18. p. 1114.

Experimentally IYENGAR and RAO in 1932 were able to infect a high proportion of *A. ludlowi* var. *sundaica* with filarial embryos, mature

larvae being found in 10 days in 28 out of 41 specimens [see this *Bulletin*, 1933, Vol. 30, p. 227]. Examination of 150 inhabitants of the Mentavei Islands, Sumatra, by Boers, Klyn and Boon van Ostade revealed none infected and the author himself examined 41 with the same result. He did, however, find an infected specimen of *A. ludlowi* in the convict barracks and consequently examined the blood of the convicts, 86 in number, and found three infected, all of whom had come from Banjermasin district. The mosquito must, he states, have infected itself from one of the convicts. *H. H. S.*

Oliver (Andrés G.) & Oliver (José). **Filariasis in Puerto Rican Soldiers. A Survey.**—*Puerto Rico Jl. Public Health & Trop. Med.* 1938. Sept. Vol. 14. No. 1. pp. 18–20. [Spanish version pp. 21–23.]

Comparison of the results of three surveys, made on Porto Rican soldiers in 1903, 1932 and 1937, leads to the conclusion that filariasis is disappearing rapidly from the soldiery.

In 1903, Ashford found microfilariae in the blood of 12 per cent. of 250 soldiers stationed at Cayley, a hill station, who before enlistment had lived in crowded towns, and a large proportion had presumptive evidence of infection before entering the service. In 1932, Ashford and Snyder examined 480 native soldiers stationed at San Juan and found microfilariae in the blood of 3·7 per cent. In 1937 the authors surveyed 794 men, 544 stationed at San Juan with 2·5 per cent. positive for microfilariae and 250 at Cayley with 0·4 per cent. (1 man) positive; moreover 11 of the 18 men positive in 1932 were still in the service, and 10 of them had no symptoms and no microfilariae in the blood. It is pointed out that there is no such lessening of infection in civil life; Ashford in 1902 estimated 10 per cent. of the population of Ponce as infected, O'Connor and Hulse found infection in 28·3 per cent. of 2,098 persons in Porto Rico in 1929–31, and Tampi 7·7 per cent. of 518 persons in Santurce in 1931. *C. L.*

Hu (Stephen M. K.). **Preliminary Observations on the Effects of Filarial Infection on *Culex pipiens* var. *pallens* Coq.**—*Chinese Med. Jl.* 1939. Feb. Vol. 55. No. 2. pp. 154–161.

A report on 200 infected *C. pipiens pallens*.

"The data so far obtained appear to indicate that the mosquitoes which were able to survive longest in the infected lots were generally either those that were negative to infection or those that were harbouring few larvae. However, those that succumbed soon after the completion of the incubation period consisted of many lightly infected as well as the heavily infected specimens."

C. L.

Hu (S. M. K.). **Observations on the Development of Filarial Larvae during the Winter Season in Shanghai Region.**—*Amer. Jl. Hyg.* 1939. Mar. Vol. 29. No. 2. Sect. D. pp. 67–74. With 3 figs.

"1. It was experimentally found that, under winter conditions in Shanghai during 1935–36, few of the microfilariae ingested by *Culex pipiens* var. *pallens* from a case of *Wuchereria bancrofti* infection were able to penetrate into the coelomic cavity of their mosquito host. For example, 57 living and 54 dead microfilariae were present in the stomach contents

of a mosquito dissected on the twelfth day after its only infective feed. [The latter sentence is taken from the text itself.] Those which succeeded were found unable to undergo development in the mosquitoes.

" 2. Some infective filarial larvae which developed from experimentally infected *Culex pipiens* var. *pallens* during the latter part of November were found able to survive in their mosquito hosts until about the middle of the following March.

" 3. That the infective filarial larvae would be able to survive longer in the *Culex pipiens* var. *pallens* if they were not exposed to the low temperature prevailing during the winter season was indicated by the results of an experiment whereby some of the infected mosquitoes were kept in a slightly heated room while others were kept in an unheated room."

C. L.

Hu (S. M. K.). **Studies on the Susceptibility of the Shanghai Mosquitoes to Experimental Infection with *Wuchereria bancrofti* Cobbold. VI.** *Culex vagans* **Wiedemann.**—*Peking Nat. Hist. Bull.* Peiping. 1938. Vol. 13. Pt. 2. pp. 113–116. [Summarized in *Rev. Applied Entom.* Ser. B. 1939. June. Vol. 27. Pt. 6. p. 124.]

" During 1934–35, experiments similar to those already noticed were undertaken in Shanghai to determine the susceptibility to infection with *Filaria* (*Wuchereria*) *bancrofti* of females of *Culex vagans*, Wied., reared from larvae collected locally. Of the 206 mosquitoes dissected 13–21 days after the infecting feed, 189 harboured infective larvae. The average number of larvae per infected mosquito was 10·2; infestation was exceptionally heavy in a few of the mosquitos, and one dissected 13 days after the infecting feed harboured 111 infective larvae. The normal completion of development of so many larvae is considered to indicate that this species is a very suitable intermediate host. When a series of *C. vagans* was fed at the same time as a series of *C. pipiens* var. *pallens*, Coq., on the same infected person, 74 out of 78 of the former and 47 out of 49 of the latter were found to harbour infective larvae after 12–18 days, the average number of larvae per infected mosquito being 10·9 and 9·3, respectively."

Yokogawa (Sadamu). **Studies on the Mode of Transmission of *Wuchereria bancrofti*.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. Feb. 28. Vol. 32. No. 5. pp. 653–668. With 4 figs. [13 refs.]

——. **Investigations on the Mode of Infection of *Wuchereria bancrofti*.**—*Japanese Jl. Med. Sci.* V. Pathology. 1938. Vol. 3. No. 3. pp. 167–181. With 6 figs. on 1 plate. [14 refs.]

These two papers on the transmission of *W. bancrofti* cover the same ground and largely use the same words in doing so. They deal with the question whether besides the mosquito in which the larva develops, there is a second host in which it lies in wait for a chance to infect man.

After a historical survey, the experiments done in Yokogawa's laboratory by Abe [this *Bulletin*, 1938, Vol. 35, p. 389] are tabulated; they were made to determine the viability of infective larvae in various media. When these larvae were placed in water with *Cyclops leuckarti* and *C. fimbriatus* they were eagerly eaten and completely digested; and though rarely eaten by *Diaptomus* they were as fully digested when they were, nor were other forms of animal life which frequent domestic water cisterns implicated. It was observed that larvae live longer in water at room temperature than at body temperature, a phenomenon " unreported by a previous observer." [It

falls into line with the observation (Bahr, *Filariasis and Elephantiasis in Fiji*, Report to the London School of Tropical Medicine, 1912, pp. 182, 183) that microfilariae live in citrated blood for 3 days at room temperature and for 12 hours at 37°C.]. In monkeys fed with infective larvae placed on a banana or having had these introduced into a loop of jejunum, no trace of infection could be found in the body. In 569 persons examined in the village of Ohama on Ishigaki Island there were, from 6 to 20 years of age, quinquennial percentages of infection of 22·92, 21·14 and 26·99. "It is evident that the rate per 5 year period increases extremely slightly so that it may be assumed that fresh infections rarely occur. Consequently, even if we admit the mosquito to be the vector, filariasis does not spread as rapidly as does malaria which is known to be transmitted by anopheles." Comment is not made in the script of the fact that the respective decennial infection rates between 21 and 50 were 44·64, 53·85 and 56·00. Of 221 female Culicines two were infected, the low infection rate for a heavily infected region throwing doubt on the rôle of the mosquito as vector. Larvae of an unstated sort obtained from two "mosquitoes" [? by dissection] failed to enter the abdominal wall of a pup or the ear of a mouse when the skin was intact, but when a mouse was treated by the depilatory "Eva cream" and the skin then needled, one larva was found in the subcutaneous tissue. After mosquito bites larvae were found on and in the skin, and in one case (illustrated) it is believed that the larva entered through the mosquito puncture. It is concluded that the spread of the disease is largely a matter of chance, its transmission being limited by a number of adverse factors. *C. L.*

Yokogawa (Sadamu) & Yoshino (Takayoshi). **On the Spread of *Wuchereria bancrofti* and its Relationship to the Human Flea, *Pulex irritans*.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1938. Oct. Vol. 37. No. 10 (403). [In Japanese pp. 1540–1543. English summary p. 1544.]

Since the extensive distribution of Bancroftian filariasis is yet not as extensive as that of *Culex fatigans*, these writers, in the hope of finding another larval host, experimented with *Pulex irritans* (363 male and 528 female fleas). All larvae found in the fleas were in clots in the midgut and, apart from unsheathing, were unchanged. It is concluded that the human flea has nothing to do with the spread of filariasis. *C. L.*

Galliard (H.). Sur la biologie des culicidés du genre Mansonia R. Blanchard en Indochine. [**Biology of *Mansonia* Species in Indo-China.**]—*Ann. Parasit. Humaine et Comparée.* 1939. May 1. Vol. 17. No. 3. pp. 177–186. With 1 text fig. & 6 figs. on 2 plates. [14 refs.]

The three species of *Mansonoides* which occur in Indo-China, *M. indianus*, *M. annulifera* and *M. uniformis*, are probably concerned in the transmission of *Microfilaria malayi* and *Wuchereria bancrofti*, though conclusive evidence is lacking. In Tonking the larvae of these mosquitoes are associated much more commonly with the water hyacinth *Eichhornia crassipes*, and with the submerged leaves of *Salvinia natans*, than with the water lettuce *Pistia stratiotes*. In the south, on the other hand, in Cochin-China and Cambodia they are

associated chiefly with *Pistia.* The author has not confirmed the observation that decaying vegetation is necessary for the development of the larvae. He has also obtained transformation from fourth stage larvae to adults in distilled water without any plants. Apparently the larvae and pupae can on occasion obtain oxygen directly from the water surface like other genera of mosquitoes. *V. B. Wigglesworth.*

Meyers (F. M.) & Kouwenaar (W.). Over hypereosinophilie en over een merkwaardigen vorm van filariasis. [**Hypereosinophilia and an Unusual Form of Filariasis.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1939. Apr. 4. Vol. 79. No. 14. pp. 853–873. With 8 figs. on 2 plates. [22 refs.] English summary.

"In seven Javanese men the authors observed a general swelling of the superficial lymphatic glands with particularly severe tumification of the glands in and under the groin, associated with a severe eosinophilia of the blood. In the excised glands from the groin eosinophilic abscesses were found, containing a small worm with all the characteristics of a microfilaria. In some cases at the periodical observations over a period of 3 years or more, no filaria could be found in the blood and the eosinophilia remained constantly on a high level. Some patients had an inflammation of the glands with purulent discharge. No symptoms of filariasis malayi or Bancrofti could be found. No adult filariae were seen in the excised glands. The clinical, anatomical and parasitological findings do not permit a definite diagnosis as to the species of filaria involved. Also the epidemiology gave no help in their determination, the cases all occurring in a non-endemic area.

"Two patients suffered from asthma bronchiale and two from a haemorrhagic nephritis. It is suggested that these 2 symptoms together with the eosinophilia may have a common allergic origin, brought about by the filarial infestation."

Bonne (C.). Over hypereosinophilie in de milt gecombineerd met een filaria-infectie. [**Hypereosinophilia and Filaria Infection of the Spleen.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1939. Apr. 4. Vol. 79. No. 14. pp. 874–876. With 2 figs. on 1 plate. English summary.

"Description of an infestation of the spleen-tissue with microfilariae in a Javanese man, who was killed in a motor-car accident. The presence of the microfilariae was discovered during the routine histological examination of the internal organs. Nothing is known about the presence of microfilariae in the patient's blood. The other internal organs were negative however. The spleen had reacted with an extraordinary degree of eosinophilia and some peculiar giant cells were noted, surrounding the terminal ends of the larvae. The extreme degree of eosinophilia, for which no other explanation is available must have some connection with the presence of the microfilariae. It represents either an undescribed phase in the life of one of the common filarial species or a manifestation of an unusual filarial parasite and altogether this condition is in many ways comparable to the eosinophilic microfilarial manifestations in lymph glands described by Meyers and Kouwenaar in this same number."

Makar (Neguib). **On Filariasis of the Intrascrotal Structures.**—*Jl. Egyptian Med. Assoc.* 1938. Nov. Vol. 21. No. 11. pp. 682–715. With 17 figs. (15 coloured on plates) & 11 microphotographs. [37 refs.]

A report on 10 cases of endemic funiculitis, and on 38 out of 100 cases of chronic intrascrotal swellings not gonorrhoeal in origin and

operated on during the last four years, and which were filarial in origin.

Of the acute cases 1 was gangrenous, 1 was non-suppurative and 8 were suppurative. The microscopic appearances were those of sepsis, intratesticular haemorrhage and lymphocytic infiltration. In 3 gangrenous or acute suppurative conditions with orchidectomy no worms could be found. In a fourth orchidectomy the lesions were essentially those of chronic affection in a man with urinary bilharziasis, subsequent examination showing many filarial worms in the cord lymphatics, with, in some parts, histological findings peculiar to suppuration ; in no other case were these worms found in the spermatic cord. In comment Makar concludes that worms in the cord lymphatics may die and be absorbed without trace if they remain sterile ; bacterial infection of different grades of virulence may be superadded, and equally here worms may die and be absorbed ; the effects on the various intrascrotal structure are considered.

Of the 38 chronic filarial lesions, 19 affected the cord alone, 6 cord and epididymis, 3 cord, epididymis and tunica, 4 the epididymis alone and 6 the tunica alone. They are considered under the anatomical headings concerned, symptomatology, diagnosis and treatment. As to the last the value of the sulphonamide group in bacterial infections is noted, as is the risk that X-rays may damage the testis. In surgical treatment it is urged that " the surgeon should not forget that he is dissecting lymphatics, the collateral circulation of which might already have been overtaxed by previous inflammations. Excision should, therefore, as much as possible be restricted to the diseased tissues."

The reproductions of the microphotographs are not clear, those of the paintings are vivid. *C. L.*

Lambrichts (G.). Oedème filarien de la face. [**Filarial Oedema of the Face.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. June 30. Vol. 18. No. 2. pp. 351–352.

Lippelt (Heinrich) & Mohr (Werner). Zur Diagnostik der Filarienerkrankungen. [**The Diagnosis of Filarial Diseases.**]—*Klin. Woch.* 1938. Nov. 26. Vol. 17. No. 48. pp. 1684–1689. [11 refs.]

Denovan (A. E. Botsford). **Sulphanilamide for Filarial Lymphangitis.** [Correspondence.]—*Brit. Med. Jl.* 1938. Oct. 29. p. 919.

In praise of sulphanilamide for filarial lymphangitis on an experience of one case observed for only 48 hours after an attack began. *C. L.*

Poynton (J. Orde) & Hodgkin (E. P.). **Two Microfilariae of the Kra Monkey** (*Macaca irus*).—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. Jan. 28. Vol. 32. No. 4. pp. 555–556.

Of these two microfilariae from *Macaca irus*, one is indistinguishable from *Mf. malayi* and was found in one of eleven monkeys examined. Of species of *Mansonia* fed on this monkey, infection took place in four of six *M. annulifera*, in 18 of 21 *M. longipalpis* and in 34 of 36 *M. uniformis*. In all but one mosquito, mature larvae were found on the tenth day. Attempts are being made to infect monkeys of this species with this infection derived from man, and to trap others for dissection in order to recover the adult worms.

The second microfilaria is about 600 μ long and 5 μ wide, and probably the adult is not a parasite of man. *C. L.*

Underwood (Paul G.) & Harwood (Paul D.). **Survival and Location of the Microfilariae of *Dirofilaria immitis* in the Dog.**—*Jl. Parasitology.* 1939. Feb. Vol. 25. No. 1. pp. 23–33. [19 refs.]

"1. An uninfected dog was transfused intravenously with blood containing approximately 233,000 microfilariae of *Dirofilaria immitis*.

"2. The microfilariae survived in the blood stream of this dog for more than two years.

"3. At autopsy, about 2½ years after the injection of the microfilariae, no embryos could be found in the blood.

"4. No increase in size of the embryos was noted at any time.

"5. As other authors have noted, comparatively few of the introduced microfilariae appeared in the peripheral circulation following injection.

"6. Lane's hypothesis that most of the artificially introduced microfilariae are removed by the cells of the reticulo-endothelial system and subsequently destroyed, is not substantiated.

"7. Available evidence indicates that a part of the microfilariae are concentrated in the capillary networks throughout the body, and a part leave the blood stream altogether; this is possibly true for all microfilariae in the blood stream, whether sheathed or unsheathed.

"8. Whether or not the microfilariae live for long periods under natural conditions in the presence of adult worms cannot be ascertained on the basis of available data. There is evidence that the macrophage system, activated by some type of immunological reaction, may destroy large numbers of microfilariae in a short time, but there is also evidence which suggests that such reactions are of irregular occurrence, and that they do not regularly affect microfilarial longevity or periodicity."

[The conclusions in paras. 5 and 6 seem contradictory. In the experiment cited in the paper microfilariae were injected into the dog's blood in numbers corresponding to 100 per cc. of its total estimated volume; by next day the numbers were reduced to 4 per cc.; most microfilariae had certainly been removed from the circulating blood. That the young of *W. bancrofti* are destroyed in numbers by the reticulo-endothelial cells is something more than hypothesis; there are the visual observations first that these cells are greatly increased in numbers in those parts of that system where microfilariae and other young filarial forms are especially collected, and second that many of these parasitic forms are markedly degenerate there; it is a conclusion which, I think, will be generally drawn. No visual evidence for para 7 is offered, the statement is inference; to suggest that there must be a hiding place used by *Mf. bancrofti* by day, which yet has escaped detection by workers in tropical medicine for 50 years, seems to reflect little credit on a band of able men.] *C. L.*

Augustine (Donald L.). **Observations on the Occurrence of Heartworms, *Dirofilaria immitis* (Leidy 1856), in New England Dogs.**—*Amer. Jl. Hyg.* 1938. Nov. Vol. 28. No. 3. pp. 390–395. [10 refs.]

One of the observations on this dog filariasis merits remembrance for human infections. Microfilariae were found in the blood of two cocker spaniel pups five months old. According to Hall, Price and Wright (1934) maturity is not reached till this parasite is eight months old. Either this interval is at least not invariable or prenatal infection occurs. *C. L.*

Molser (H.). *Filaria perstans.—Arch. f. Schiffs- u. Trop.-Hyg.* 1939. Mar. Vol. 43. No. 3. p. 130.

Acanthocheilonema perstans is not a harmless parasite. It causes fever as high as 38° to 39°C. (since this is attributable to no other cause) and the microfilariae disappear from the blood under intravenous injections of 1 per cent. methylene blue beginning with doses of 2 cc. and rising to 10 cc. It at least merits investigation as to whether this parasite can cause illness. *C. L.*

East African Medical Journal. 1939. Feb. Vol. 15. No. 11. pp. 369–377. **Onchocerciasis [in East Africa].**

A symposium of onchocerciasis in Equatorial Africa, largely historical and already dealt with in this *Bulletin*. A letter from Hawking reports that at Kakamega, Kenya, he examined two groups of persons. The one consisted of 52 prisoners and mine labourers selected on account of possible eye trouble; in them Onchocerca microfilariae were found, evidently in the skin, and nodules in the upper part of the body in 7. The other group was of 53 patients taken at random in a native hospital and in them these microfilariae were found in 20 and nodules in 1. *C. L.*

Harley-Mason (R. J.). **Filarial Blinding in Kenya.**—*East African Med. Jl.* 1939. Feb. Vol. 15. No. 11. pp. 363–368.

Three cases are reported, all coming from the Kakamega district of Kenya, in all of whom there were the ocular symptoms and ocular lesions associated with Onchocerca infection and a heavy eosinophilia, while in two of them Onchocerca larvae were recovered from the skin. Reference is made to Hawking's findings in this district [see above].

C. L.

Gopsill (W. L.). **Onchocerciasis in Nyasaland.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. Jan. 28. Vol. 32. No. 4. pp. 551–552.

A report on 20 cases of onchocerciasis in the district of Cholo in the Shire Highlands.

No patients have been seen from Lower Shire or North Nyasa in the lowlands. In the fast-flowing highland streams *Simulium damnosum* is found. In seven of the patients with nodules, frequent and extensive blood examinations failed to disclose embryos, and the same result followed examinations of 850 persons (even to the extent of five films every other day for 10 days) living in infected parts. In the same way 100 lymph smears from the 20 patients and from 80 others failed to show any microfilariae, but these were once found in the blood during the actual removal of a cyst and again four hours later in a node puncture done in this person. No nodules in this geographical area were found in the scalp, neck and upper limbs, nor were there disturbances of vision or symptoms attributable to infection in the central nervous system, although in one with a family history of epilepsy the attacks began when nodules appeared "near the ninth rib, mid axillary line and near the coccyx" and disappeared when these tumours

were removed. In the same way where there has been referred pain it has disappeared with removal of the nodule concerned. Excised nodules have commonly contained four male and eight female worms.

C. L.

Dubois (A.), Vitale (S.) & Birger (Ch.). Contribution à l'étiologie de l'éléphantiasis congolais. Région de Betongwe-Chefferie Medjeje. [**The Aetiology of Elephantiasis in the Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1939. Mar. 31. Vol. 19. No. 1. pp. 27–31.

Microfilariae in the skin are fairly frequent in cases of elephantiasis in the Medjeje chieftainship, *Mf. volvulus* in genital elephantiasis and *Mf. streptocerca* in that of the lower limbs ; but the fact that the former has a low percentage among the sick and the latter is very abundant in the healthy, does not allow of the conclusion that these filariae alone are the cause of the elephantiasis. *C. L.*

Dubois (A.) & Forro (M.). Contribution à l'étiologie de l'éléphantiasis congolais. Le rôle de *O. volvulus* étudié au Nepoko. [**The Aetiology of Elephantiasis in the Congo. The Rôle of** *O. volvulus*.]—*Ann. Soc. Belge de Méd. Trop.* 1939. Mar. 31. Vol. 19. No. 1. pp. 13–21.

The investigations lead to the conclusion that *Onchocerca volvulus* favours the appearance of elephantiasis but is not its primary cause.

In this region some 80 per cent. of persons show Onchocerca nodules, in 75 inhabitants examined at night *Mf. bancrofti* was absent, and in 56 per cent. of persons with genital elephantiasis no Onchocerca nodules were found in spite of very close examination. *C. L.*

Déjou (L.). Suppuration d'un kyste à onchocerques (*Onchocerca volvulus*). [**Suppuration in an Onchocerca Cyst.**]—*Bull. Soc. Path. Exot.* 1938. Oct. 12. Vol. 31. No. 8. pp. 725–726.

A swelling in the left buttock with fever and pain was incised and some cubic centimetres of turbid fluid escaped. Next day a bunch of worms lay on the dressing identified by Advier as *O. volvulus*, and one or two continued to be passed daily. The tumour was excised and proved to be an irregular fibrous mass " as large as a nut " [volume global d'une noix] in the subcutaneous tissue adherent to the muscle, loculated on section with Onchocerca worms in cavities.

C. L.

Advier & Déjou (L.). Arthrite aiguë du genou avec présence d'embryons d'*Onchocerca volvulus* dans le liquide articulaire. [**Acute Arthritis of the Knee :** *Microfilaria volvulus* **in the Articular Fluid.**]—*Bull. Soc. Path. Exot.* 1938. Oct. 12. Vol. 31. No. 8. pp. 727–730.

There was in fact a double parasitism with Onchocerca and Dracunculus.

The Onchocerca showed itself by acute arthritis of the left knee with many *Mf. volvulus* in the synovial fluid, which contained many polynuclears but no bacteria on culture ; and behind the knee in the

popliteal space by a tumour which excision showed to be a subfascial cyst containing adult *O. volvulus*. The Dracunculus infection showed itself later under the left ligamentum patellae, above the right internal malleolus, another worm a little higher up, a fourth on the right thigh and a fifth on the right heel. In the sinus where the third worm pointed there were embryos of *O. volvulus* as well as of *D. medinensis*. It is stressed that two examinations made at an interval of two days have shown, one many microfilariae, the other none. *C. L.*

GIBBINS (E. G.). **Simuliidae and Onchocerciasis in Uganda.**—*East African Med. Jl.* 1939. Feb. Vol. 15. No. 11. pp. 378–384. [19 refs.]

WANSON (M.). Observations sur la biologie des cératopogonidés et des simulidés du Bas-Congo. [**Biology of Ceratopogoninae and Simuliidae in the Lower Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1939. Mar. 31. Vol. 19. No. 1. pp. 97–112. [13 refs.]

HUARD (P.). Quelques remarques sur les arthrites par ver de Guinée. [**On Guineaworm Arthritis.**]—*Bull. Soc. Path. Exot.* 1938. Oct. 12. Vol. 31. No. 8. pp. 722–725.

Two cases of streptococcic inflammation in the knee joint were certainly and a third was probably associated with an adjacent guineaworm. In two the joint was afterwards left rigid, in the third it could be bent to a right angle. *C. L.*

GALLIARD (Henri). Unicité ou pluralité des *Strongyloides*. [**Are there One or Many Strongyloides Species ?**]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 5. pp. 413–416.

This discussion of the writings of various workers points out the structural similarity of Strongyloides species from different animals and, in considering the question of acquisition of infection by man from the dog, points out the complexity of the epidemiology—the result of the great instability of types which come from different sources. *C. L.*

DE PAULA E SILVA (Geraldo Siffert). Estrongyloidiase duodenal. [*Strongyloides stercoralis* **in the Duodenum.**]—*Brasil-Medico.* 1938. Sept. 10. Vol. 52. No. 37. pp. 835–839. English summary.

Examination of material aspirated from the duodenum proved a far more certain means of diagnosis of strongyloides infection than did faecal examination.

Of 1,942 persons examined, all in good circumstances, 17 were found infected with strongyloides ; 13 of these showed larvae in the duodenal contents only, 2 in the faeces only, and 2 in both. In 11 there was complaint of pain in the upper abdomen, fullness or weight after food, salivation or diarrhoea. All were nervous, local epigastric tenderness was present in 6, X-rays showed evidence of duodenitis in 2, while the microscope gave evidence of irritation or inflammation in 9. There was hyperchlorhydria in 2, achlorhydria in 4, and normal values in the rest. *C. L.*

Simpson (Virgil E.). **Strongyloidiasis.**—*Jl. Amer. Med. Assoc.* 1939 Mar. 4. Vol. 112. No. 9. pp. 828–832. [34 refs.]

The treatment by " compound solution of iodine " was carried out successfully in 9 cases as follows :—

" A saline purgative was administered one hour before supper. This was expected to act before the patient's bedtime. Breakfast was withheld the following morning. A transduodenal tube equipped with a Lyon metal bulb was introduced, the stomach irrigated and the tube allowed to pass into the duodenum. The duodenal contents were aspirated for the twofold purpose of securing a specimen for laboratory examination for parasites and to remove contents, thus lessening the dilution of the drug to be introduced into the bowel.

" Compound solution of iodine was then introduced into the duodenum and the tube withdrawn. The dose finally fixed was 60 minims (4 cc.) and was given on alternate days until neither the duodenal contents nor the feces showed ova, parasites or larvae. After two weeks the duodenal contents and feces were examined. If the results were negative, the patient was instructed to return in one month for another laboratory study."

An energetic mop-up campaign of washing, scrubbing, sunning, painting, and liming, the treating or killing of all household pets and the examination and treatment if necessary of all members of the family are held to be essential measures.

" Examination of the water supply has shown no ova in my experience."

[Liq. Iodi. Co. U.S. has the composition : Iodine 5, potassium iodide 10, water to 100, and is approximately the same as Lugol's solution, the dose of which is minims 5 to 10.] *C. L.*

Torres (C. Magarinos) & de Azevedo (A. Penna). Lesões produzidas no homem por *Strongyloides*. Sobre a " hyperinfection ". [**Lesions produced in Man by Strongyloides. On Hyperinfection.**]—*Livro Jubilar do Prof. L. Travassos.* Rio de Janeiro. 1938. pp. 475–488. With 9 plates. [24 refs.]

There are described the findings at autopsy in two persons with strongyloides infection, and in whom the larvae [born presumably in the intestinal canal] had penetrated into the wall of the colon in great numbers and had been carried thence to lymph nodes, liver and lungs.

It is believed that all the larvae were in the rhabditiform stage. They entered the wall of the colon through ulcers of which there were a number (that is to say many larvae were found at their bases), but they were found also where there were no ulcers and they crept down Lieberkühn's glands and seemingly entered the connective tissue at the ends of these. In this tissue they caused diffuse haemorrhage and infiltration with polynuclear, eosinophil, macrophage and giant cells. This region they left by lymph or blood escalator. Those travelling by lymph were apt to penetrate into the walls of the lymph vessels and cause subendothelial nodules, while in a lymph node there was giant cell formation. Those which entered the blood stream might produce thrombosis in the coeliac veins, the clot being invaded by lymphocytes and macrophages. Larvae which had reached the liver might be found within the walls of the portal veins, or in the portal spaces, surrounded by a cellular exudation. In the lungs [which they may clearly have reached by either blood or lymph escalator] they broke through into the alveoli and blood escaped with them. The illustrations are convincing. *C. L.*

Schenken (John R.) & Moss (E. S.). *Trichostrongylus colubriformis* **in the Human Appendix. Report of a Case in Louisiana.**—*Jl. Lab. & Clin. Med.* 1938. Oct. Vol. 24. No. 1. pp. 15–17. With 1 fig.

The first report of *Trichostrongylus colubriformis* in man in America, though it is common in ovines there.

In an appendix removed for recurrent abdominal pain there were found in the lumen two male *Enterobius vermicularis* and one male *T. colubriformis* identified by Faust. To the naked eye the appendix was normal; in the wall were patches of plasma cells and some macrophages; it is not believed that the parasites were concerned in the symptoms. No ova were found in the faeces, though the girl had an eosinophilia of 7 per cent. about a month later. *C. L.*

Cram (Eloise B.) & Reardon (Lucy). **Studies on Oxyuriasis. XII. Epidemiological Findings in Washington, D.C.**—*Amer. Jl. Hyg.* 1939. Jan. Vol. 29. No. 1. Sect. D. pp. 17–24. With 2 figs. (1 map).

Of 2,097 persons examined by the N.I.H. swab in or near Washington 41 per cent. were found infected by threadworms.

This paper considers 1,362 persons from institutions already reported upon in the series as well as 735 from the general population, and as regards the latter group the writers consider that it represents fairly well, as to social and economic status, a cross section of the white population of Washington. Those found infected were most numerous in, but far from being confined to, the older comparatively congested residential sections of the city round the Capitol. While the numbers are felt not to be sufficiently large to constitute a fair sample of the whole population, they do at least show that infection with *Enterobius vermicularis* is a public health problem of considerable importance without restriction of sex, race, age, social-economic status or place of residence. *C. L.*

Nolan (M. O.) & Reardon (Lucy). **Studies on Oxyuriasis. XX. The Distribution of the Ova of** *Enterobius vermicularis* **in Household Dust.**—*Jl. Parasitology.* 1939. Apr. Vol. 25. No. 2. pp. 173–177.

"Ova of *Enterobius vermicularis* were found in dust collected at all levels in all of the rooms of 7 houses occupied by one or more persons heavily infected with pinworms. The ova, in part at least, must have been carried by air currents. Infection by inhalation is therefore theoretically possible and should be considered in the prophylaxis and therapy of oxyuriasis."

The eggs were collected by passing a camel hair brush moistened with water over the surface being investigated; it had been passed through a perforated rubber stopper fitting a test tube and was thus transported to the laboratory. Here the brush was dipped gently into decinormal caustic soda solution in a deep well slide and examined. Of the 241 dust samples collected from these 7 houses, threadworm ova were found in 221 (91·7 per cent.) and in largest numbers in bedrooms. About a quarter of the eggs were too disintegrated for the stage of development to be stated, of the rest more than three-quarters contained fully formed embryos, and though only 15 of them were

mobile when examined, yet their appearance suggested that half the rest were viable or only just dead. This was confirmed by incubating 24 of these eggs, selected at random, in "digestive juice" at 37°C., when 14 had hatched partly or completely and another was active but had not hatched. The sites of the ova were many; including bedding, tub, basin, toilet seat, and children's toys and outer play garments, and a trichuris egg was collected from the middle moulding of a bedroom door. [Presumably it too was airborne.] *C. L.*

HAMBURGER (Franz). Die Oxyurenneurose. [**Neurosis from Threadworms.**]—*Med. Klin.* 1939. Mar. 24. Vol. 35. No. 12 (1787). pp. 369–370.

Threadworm infection is usually harmless and to subject a child to measures for prevention which continually draw attention to the condition is to produce neurosis in both mother and child. The best procedure is to treat pruritus, if present, by a simple ointment, and to give garlic enemata and small doses of santonin, but the latter treatments should not be continued for more than a day or two at a time. *C. W.*

WRIGHT (Willard H.), BOZICEVICH (John) & GORDON (Leon S.). **Studies on Oxyuriasis. VII. Clinical Improvement following Treatment with Single Doses of Tetrachlorethylene.**—*Amer. Jl. Trop. Med.* 1938. Sept. Vol. 18. No. 5. pp. 609–617.

"Among 50 boys of school age treated for oxyuriasis with single doses of tetrachlorethylene, clinical improvement occurred in a number of cases as indicated by gains in weight, amelioration of certain symptoms, and changes for the better in social attitude and scholastic standing."

"The need for detailed studies concerning the clinical features of oxyuriasis is pointed out, since in this regard there appears to be a dearth of reliable data based on adequate surveys of a sufficient number of cases."

C. L.

HALL (Maurice C.). **Three Parasites which Habitually Surmount our Sanitary Barriers.**—*Livro Jubilar do Prof. L. Travassos.* Rio de Janeiro. 1938. pp. 195–211. [16 refs.]

The three parasites are *Trichinella spiralis*, *Enterobius vermicularis* and *Entamoeba histolytica*. "So long as this trio can override the barriers we have set up for our protection, so long will it be evident that we do not yet have the requisite knowledge, ability or desire to protect ourselves from these pathogens."

Trichinosis—Recent autopsies on a large scale have shown that in man the incidence of this infection in the United States lies between 10 and 20 per cent., that in swine it is not less than it was 40 years ago, that man gets his infection from swine, and that swine get theirs from other swine through giving them to eat raw material which in a poorer country would be cooked and eaten by man. Press warnings have proved useless, people will not sterilize pork by proper cooking, and it is felt that the most likely means of betterment is through the packers (the purchasers of swine-growers' products) by an insistence that what they buy shall meet certain reasonable specifications. The

present state of affairs has essentially come about as the result of political and economic conditions based on international trade.

Enterobius infection.—Stress is laid on its prevalence in Washington, amounting to 35 per cent. of the general population, as disclosed by anal scraping (done often on one occasion only, by the N.I.H. swab), and on the way in which the eggs, when dried and no longer sticky, will fall off the body, sift through clothing, and be widely dropped on floors, chairs, carpets, at home and in streets, churches, playgrounds, shops and elsewhere, and will even be carried by air. As they are not, except by accident, faecal constituents, they are not prevented from spreading by the ordinary sanitary measures which limit ordinary intestinal parasites. Treatment is likely to be the only effective means of combat and some work indicates that " the use of a suitable anthelmintic 3 times a day over a period of 10 days will do much to defeat pinworms " [see WRIGHT and BRADY, this *Bulletin*, 1939, Vol. 36, p. 329], while the thorough use of a vacuum cleaner will perhaps be of considerable value.

Entamoeba histolytica apparently surmounts sanitary barriers by a residuum of cysts remaining about the anus and being passed on by means of " food handlers, swimming pools, underwear, bedding, towels, washrags and other objects." *C. L.*

HOOD (Marion) & OLSON (S. W.). **Trichinosis in the Chicago Area.**—*Amer. Jl. Hyg.* 1939. Mar. Vol. 29. No. 2. Sect. D. pp. 51–56. [19 refs.]

" Numerous publications indicate that the average incidence of trichinosis in the United States is approximately 13 per cent. As no survey had been made in the Chicago area a series of 428 autopsy cases was studied.

" The material was obtained from unselected autopsies performed at several Chicago hospitals. When both the digestion and pressed muscle methods were employed, 16 per cent. of the diaphragms were found infected with the larvae of *Trichinella spiralis*. These results are in accord with those found in surveys from other localities.

" Of the 428 samples investigated, 48 were from infants under 1 year of age. Four (8·3 per cent.) of these contained trichina larvae.

" A method is suggested for a more rapid means of investigation in surveys for *Trichinella spiralis*." *C. L.*

BOZICEVICH (John). **Studies on Trichinosis. XII. The Preparation and Use of an Improved Trichina Antigen.**—*Public Health Rep.* 1938. Dec. 2. Vol. 53. No. 48. pp. 2130–2138. With 1 fig. [Summary appears also in *Bulletin of Hygiene*.]

The antigens which have been used have been prepared in various ways and probably are not of equal value. In the method described the Trichinella larvae prepared from digested infected meat are obtained with a minimum of débris and special care is taken to obtain them free from proteins. The dried ground larvae are extracted with neutral 0·85 per cent. solution of sodium chloride. No preservative is used in making the antigen but the vials are subjected to fractional sterilization. It shows no loss of titre after six months even in sunlight at room temperature. By means of precipitin and intradermal tests it was found superior to antigens prepared by other methods. It was used for both precipitin and intradermal tests in an outbreak of 44 cases of trichiniasis and all the patients ultimately reacted positively

to both tests. A method is described and recommended for performing the intradermal test and a procedure for measuring the reaction.

W. G. Savage.

McNaught (James B.). **The Diagnosis of Trichinosis.**—*Amer. Jl. Trop. Med.* 1939. Mar. Vol. 19. No. 2. pp. 181–192. With 5 figs. [15 refs.]

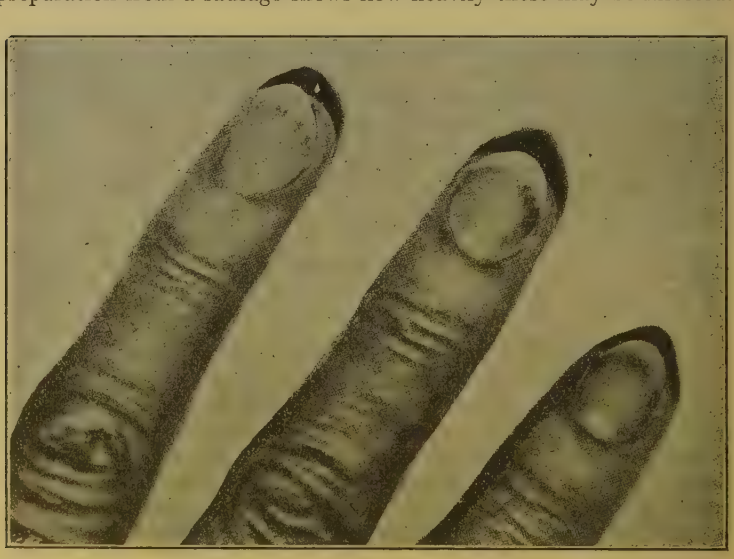
"1. While morbidity statistics indicate that less than 3 people per 100,000 suffer from trichinosis annually, the examination of cadavers proves that about 400 people per 100,000 are infected annually. It is therefore evident that physicians are not so skilful in recognizing this infection as they are in diagnosing many other diseases.

"2. The number of parasites ingested, the physical condition of the patient and the specific tissues most heavily invaded must play important rôles in the severity of trichinous infection.

"3. Attention is called to the 'splinter hemorrhages' seen beneath the nails of patients during the migrating stage of trichinosis.

"4. The finding of parasites in blood, bile, stool, cerebrospinal fluid or biopsy is possible but the diagnosis may be made without recovering the parasites from the patient. Eosinophilia is the most useful clue. Skin and precipitin tests establish that the eosinophilia is due to trichinella invasion rather than to some other cause."

A reproduced photograph shows two finger nails with "splinter haemorrhages," which Drs. Biggs and Bruck informed McNaught they have found under finger and toe nails in 60 to 70 per cent. of persons while in the active stage of infection, a sign which they believe to have been unrecorded hitherto. A photograph of a squash preparation from a sausage shows how heavily these may be infected.



Photograph showing "splinter hemorrhages" beneath the nails of a patient with trichinosis.

[Reproduced from the *American Journal of Tropical Medicine.*]

C. L.

VAN SOMEREN (Vernon D.). **The Bone Marrow in Trichinosis of the Rat.**—*Jl. Helminthology.* 1939. Jan. Vol. 17. No. 1. pp. 13-20. With 8 figs on 2 plates.

Eight rats were each infected with 500–600 encysted Trichinella larvae. The changes in the marrow of the femur are reported at from 13 to 45 days after the infection (that is during the acute stage) and at 90 days (that is after recovery).

After such a dose of larvae the percentage of eosinophils in the blood rose to 70 or 80 two to four days after infection, it then fell to 45 to 50 for a considerable time (the rat normal is 30 to 35). From one femur the red marrow, which it normally contains, was spread as a smear, the other femur after decalcification was cut in sections 10μ thick. The normal bone marrow of the rat is described. In two controls blood counts were made frequently and in all infected rats immediately before killing them. In the acute stage there is functional myeloid hyperplasia at the periphery and ends of the marrow ; the percentage of normal mature marrow neutrophils is lowered, they probably being liberated into the blood ; basophils and basophile myelocytes are fewer ; formed eosinophils of the ring nuclear type are generally more numerous than myelocytes. The differential blood and marrow counts varied in each rat.

After recovery there were two different pictures—first a persistent low grade blood eosinophilia with the marrow still showing the effect of stimulation, second a blood count with abnormally high neutrophils and normal eosinophil count ; a marrow hyperplastic but with the ratio of mature neutrophils to myelocytes inverted, and in the smear a great number of nuclear ring forms ; the changes are not directly related to the severity of the muscle infection. *C. L.*

VAN SOMEREN (Vernon D.). **The Treatment of Trichinosis. A Review of Methods.**—*Brit. Med. Jl.* 1939. Feb. 25. pp. 376–381. [67 refs.]

" The clinical and symptomatic treatment of trichinosis is briefly discussed and measures for the destruction of the parasite in the host are reviewed. Radium irradiation and catharsis appear to be of no practical value. The use of convalescent antiserum to control the toxic features of the disease should be tried if such serum could be made readily available.

" Most chemotherapeutic measures involving the use of anthelmintics, antiseptics, disinfectants and related substances, organic arsenicals and similar substances, and certain miscellaneous drugs have been shown experimentally to be of no value and perhaps dangerous. There is experimental evidence, however, that the subcutaneous injection in olive oil or gum arabic of a suspension of the commercial thymol preparation carvasept or the oral administration of butolan (Bayer) (carbamic acid ester of *p*-oxy diphenyl-methane) is lethal to a certain proportion of reproductive adults in rats, and their use results in a lessening in severity of the muscle invasion : a clinical trial of butolan should be made.

" Excellent results have followed the intravenous administration of 5 c.cm. of gluco-calcium (Lilly) during the hitherto intractable acute migratory phase ; this form of therapy should be given further clinical and experimental trials.

" Experiments with rats, rabbits, and cats have shown that calcification after encystment may be considerably hastened by the administration of some vitamin-D-containing substance, supplemented by a supply of calcium in the form of a bland organic salt, thus protecting the host from toxic effects following encystment. Though a warning has been given

that this treatment may result in a dangerous metastatic calcification of other organs, a further judicious clinical trial should be made. It should be noted, however, that this treatment is of no value before encystment of the larvae—that is, before four to five weeks have elapsed after infection."

Macit Arif. Un cas de distomatose humaine à *Fasciola hepatica* et trios cas d'anguillulloses à Zonguldak (Turquie). [**One Infection with** *F. hepatica* **and Three with Strongyloides at Zonguldak, Turkey.**]—*Rev. Méd. et Hyg. Trop.* 1938. Nov.–Dec. Vol. 30. No. 6. pp. 346–350.

Strongyloides, it is said, has not hitherto been reported from Turkey, while *F. hepatica* has been recorded twice before in man.

C. L.

Foster (A. O.) & Johnson (C. M.). **An Explanation for the Occurrence of** *Capillaria hepatica* **Ova in Human Faeces suggested by the Finding of Three New Hosts used as Food.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. Feb. 28. Vol. 32. No. 5. pp. 639–644. With 2 figs. [25 refs.]

When Capillaria eggs are found in the faeces of man, they have been ingested with his food.

Capillaria hepatica is a tissue parasite of the liver, usually of that of a rodent, the eggs are laid in the tissue of that organ and do not reach the exterior while the host is alive. After the host's death they are either freed by the decomposition of the host's body and may then be distributed by flies, or some other animal eats the infected liver. On one occasion they have actually parasitized man [MacArthur, this *Bulletin*, 1924, Vol. 21, p. 963], but ordinarily the finding of eggs in man's stool has been attributed to their having been swallowed, man having eaten rat or dog, for the dog too is an efficient host. But several cases have been reported from Panama; and those who live there do not eat rat or dog; but they do eat the white-lipped peccary *Tayassu pecari spiradens*, the red spider monkey *Ateles geoffroyi* and the white-faced monkey *Cebus capucinus imitator*—and in all of these animals the writers found *C. hepatica*. Moreover, these eggs are not visibly altered on cooking, and on feeding infected, boiled, peccary liver to monkeys and cats the eggs were found in these animals' faeces. And the Panamanians customarily cook their meats very thoroughly. *C. L.*

VENOMS AND ANTIVENENES.

Précis of Abstracts in this Section.

Bormann (p. 853) describes some of the commoner snakes of the Cameroons and the effects of their venoms. Pauli-Magnus (p. 853) comments on this and records a case showing the rapidly toxic effect of bites by *Naja melanoleuca* and the need for the early administration of antivenene. Martin del Campo (p. 853) reports that he found in the north-west of Guatemala two species of Bothrops new to Mexico.

Madame Phisalix (p. 854) calls attention to the fact already well known that the yellow venom of *Vipera aspis* is necrosing and neurotoxic in action; but some specimens produce a colourless venom

which she finds retains the latter (neurotoxic) action while losing the former and that this venom is useless for immunizing purposes. PEPEU (p. 854) presents the results of a study of the venom of *Atractaspis microlepidota* of Italian East Africa and shows its chief action to be neurotoxic; it kills by producing respiratory paralysis. IYENGAR, SEHRA & MUKERJI (p. 855) have studied the protease and the proteolytic effects of cobra venom in India. GHOSH (p. 855) and his colleagues give a detailed account of their technique for isolating the active principles contained in the venoms of Daboia (Russell's viper) and the krait (*Bungarus fasciatus*). The venom of *Crotalus terrificus* has been shown to contain about six times as much neurotoxic as coagulant principle by SLOTTA & FRAENKEL-CONRAT (p. 855). The neurotoxic constituent has been obtained pure, in crystalline form, and is a protein with neurotoxic and haemolytic properties; the coagulant principle comprises proteolytic and coagulant elements. This snake's venom possesses, therefore, two active proteins, a fact confirmed by GHOSH & DE (p. 856).

VELLARD (p. 856) studied the properties—coagulant and anti-coagulant, haemolytic and antihaemolytic, anticomplementary, proteolytic and necrosing—of the venoms of certain important Venezuelan snakes and showed that the relative preponderance of one or other property varied with the districts from which the specimens were obtained. The part played by the *spreading factor* in the mode of action of a venom as distinct from the *toxic factor* has been investigated by DURAN-REYNALS (p. 857) and FAVILLI (p. 858). The former has demonstrated that the spreading factor is more in evidence in Viperidae venoms with their marked local action than in Colubridae venoms which are predominantly neurotoxic; FAVILLI (p. 858) finds that this spreading factor is very variable and that antivenenes neutralize it by *specific* action, that is, it is not a common factor neutralized by all antivenenes.

VELLARD (p. 858) in another article discusses the haemolytic action of snake venoms and finds that it is complex and different from a corpuscle fragility due to mechanical action or such as occurs in hypertonic solutions. The same author (p. 859) has studied the important question of variation in potency of venoms obtained not only from individual snakes of the same species, but also variation with season and geographical distribution. Thus, the venom of *Crotalus terrificus durissus* in specimens from the northern Argentine is strongly proteolytic but only weakly neurotropic, whereas in those from the south the opposite obtains. In the case of *Bothrops atrox* the reverse of this was observed.

The question of attenuation, detoxication and antigenicity of venoms has been investigated by CÉSARI & BOQUET (p. 860). They find that the addition of formaldehyde reduces the toxicity of the venom but not its antigenic potency; the chemical appears to be selective, affecting the coagulant but not the haemolytic element. Viperine venom may also be attenuated by oxygen in the form of hydrogen peroxide, and, if copper is present, this action is enhanced, although the metal has no such effect in the absence of peroxide. The copper probably acts as a catalyst in fixing the oxygen.

The importance of standardization of antivenenes can hardly be exaggerated, one urgent reason being that commercial antivenenes vary much in potency. FINLAYSON & GROBLER (p. 861) describe their work in preparing a Standard Cobra antivenene in a dried form for

South Africa. Their Unit is ten times the amount needed to neutralize one m.l.d. for mice and is contained in a fixed volume. They suggest that commercial antivenenes be tested against this standard and the dose regulated accordingly. IDSEN (p. 861) remarks that standardization of antivenenes demands preliminary standardization of venoms, and since different individuals of the same species produce venom of different strengths (see VELLARD, above) and even the same individual does not produce at all times the same strength venom, as many samples as possible should be collected to obtain an average. For assaying antivenenes he finds the intravenous test in mice (Zagreb method) the most satisfactory. BOQUET (p. 862) adds further support to Calmette's view that antivenenes are not so specific as most people are inclined to believe. Apart from the specific elements there are group elements (paraspecific, the author calls them) common to several venoms and this fact should be borne in mind when preparing and employing antivenenes.

D'ABREU (p. 862) reports a case of recovery after a bite by a krait. It is probable that the patient did not receive the full dose of venom; the onset of symptoms was delayed for some hours and antivenene was not administered till 28 hours had elapsed. From description of a case of *Diplolidus typus* bite (Green Tree snake) in the Cameroons, reported by KNABE (p. 863) the venom resembles that of the Lachesis genus of South America. In the instance reported, the symptoms were mainly local with considerable resultant anaemia, but recovery ensued without specific antivenene, though 10 cc. of anti-cobra serum were given. ALLEN (p. 863) points out the advantages of the Jackson method of treatment of snake-bite—incision followed by suction—over local chemical injections.

Scorpions. SERGENT (p. 864) describes and illustrates the scorpions of northern Africa and details cases of scorpion sting in Algeria, where deaths from this cause are not very rare. He points out the value of antivenene when given early and in fairly large doses. KENT & STAHNKE (p. 865), writing of the species found in Arizona, note the seriousness of stings by *Centruroides sculpturatus* which, in children particularly, are not infrequently fatal after convulsive attacks and signs of respiratory distress. Attention is called by VARELA (p. 865) to the effect of calcium chloride in cases of stinging by another species of the same genus, *Centruroides limpidus*, but from his account it would appear to do little more than delay death in animals on which this treatment was tested. DE MAGALHÃES (p. 866) gives a general account of the common scorpions of Minas Geraes and the symptoms produced by their venoms; in a further paper he describes more fully their neurotoxic action.

Whereas (see above, CÉSARI) certain snake venoms have their toxicity attenuated by addition of formaldehyde, without reduction of their antigenicity, in the case of scorpion venom VARELA & SANCHEZ POSADA (p. 866) show that both properties are destroyed thereby.

FINLAYSON (p. 867) relates his researches on the venom of *Latrodectus indistinctus*, its thermostability, the effects on it of chemicals such as gold chloride, potassium permanganate, and formalin, and the haemolytic properties of the venom itself and of an emulsion of the dried insect. With his co-workers he shows (p. 867) that the venom has a depressant action on heart muscle. It probably contains more than one toxic principle and some of its effects may be due to the release of a histamine-like substance in the tissues. MACKINNON (p. 868)

demonstrates the variability of symptoms caused by bites of the Black Widow spider (*Latrodectus mactans*) and SMITH & D'AMOUR (p. 868) describe the production of antivenene for this species, using the cheaper rabbit in place of the sheep which has usually been employed. ANCONA (p. 868) describes the cells concerned in the production of the venom of the spider *Crypsidromus breverii*. There are, he states, two types of cells, one of which secretes the poison, while the other gives rise to it only when the cells break down.

SACCHI (p. 869) describes his experiments directed at immunizing rabbits against bee venom. *H. H. S.*

v. BORMANN (F.). Giftige Schlangen an der Kameruner Küste. [**Poisonous Snakes of the Coast of the Cameroons.**] —*Arch. f. Schiffs- u. Trop.-Hyg.* 1939. Feb. Vol. 43. No. 2. pp. 73–79. With 5 figs.

PAULI-MAGNUS. Bemerkungen zu der vorstehenden Arbeit v. Bormann. [**Observations on the Foregoing Work of v. Bormann.**]—*Ibid.* pp. 80–82. With 3 figs.

von Bormann gives a description of the appearances and habits of certain snakes, of the *Viperidae*, the "phlegmatic" *Bitis gabonica* and the "temperamental amusing" *B. nasicornis*. The venom of these exerts a strong local necrotic action and a warning is given that if the snake is held too near the anterior margin of the lower jaw, it may pierce the floor of the mouth with its fangs and so penetrate the hand.

Of the *Colubridae*, *Naja melanoleuca*, *Dendraspis viridis* and less often *N. goldii* are seen. The venom of *N. melanoleuca* acts through respiratory paralysis; the author has seen no evidence that this snake can spit its venom, as is commonly believed.

The author attributes the relative rarity of fatal snake bite in West Africa, compared with India and South America, to the sparseness of the human population and the good natured laziness of the snakes.

Pauli-Magnus records a native bitten in the thumb by *N. melanoleuca* in whom he injected 10 cc. anti-cobra serum within 10 minutes of the bite. Tight ligature of the arm, deep incision of the thumb and the rubbing in of a strong potassium permanganate solution were the other measures taken. The patient complained of severe pain and the thumb soon became anaesthetic and the axillary glands swollen, with ptosis of one eyelid, interference with speech and increased reflexes. After further serum he quickly recovered. This case demonstrates the intense action of the venom of *N. melanoleuca* and the value of serum promptly administered. *C. W.*

MARTIN DEL CAMPO (Rafael). Tres *Bothrops* de Chiapas, dos de ellas nuevas para la fauna de Mexico. [**Three Species of Bothrops from Chiapas, Two of them New to Mexico.**]—*An. Inst. Biol.* Mexico. 1938. Mar. & June. Vol. 9. Nos. 1 & 2. pp. 227–229. With 2 figs.

In an expedition to Chiapas which lies north-west of Guatemala, a collection of snakes was obtained from Comitán, a district near Guatemala. Among them were three species of Bothrops, *viz.*, *B. nummifera*, *B. nigroviridis aurifera* and *B. godmani*. The two last snakes are known in Guatemala, but, though expected to exist in Mexico, have not been met with there. *H. H. S.*

VON KLOBUSITZKY (D.) & KÖNIG (P.). Biochemische Studien ueber die Gifte der Schlangengattung Bothrops. VI. Mitteilung: Kurzer Bericht ueber verschiedene, in den Jahren 1936–37 gewonnene Versuchsergebnisse. [**Biochemical Studies of the Venom of Bothrops. VI. Short Report on Various Findings during 1936–37.**]—*Arch. f. Experim. Path. u. Pharm.* 1939. May 10. Vol. 192. No. 3. pp. 271–275. With 1 fig.

PHISALIX (Marie). Le venin blanc des vipères du département du Gers est dépourvu de pouvoir vaccinant. [**The Colourless Venom of the Vipers of Gers has no Vaccinating Power.**]—*C. R. Acad. Sci.* 1939. Apr. 17. Vol. 208. No. 16. pp. 1252–1254.

Specimens of *Vipera aspis* from certain districts had previously been found to provide colourless venom instead of the usual yellow, and this is more neurotoxic and less necrosing than the yellow, and is completely neutralized by anti-viper serum. Yellow viper venom loses its antigen and becomes more toxic on account of this loss, when subjected to short wave radiations for 30 minutes.

Tests of the colourless venom (which has maximum toxicity in summer) were made on mice. The venom was divided into two portions, one of which was heated to 75°C. for 15 minutes to destroy toxicity. This was used for vaccination and 48 hours afterwards rather more than 1 m.l.d. was injected into each animal. In all cases, with venom collected in spring, summer and autumn, no evidence of protection was seen.

This colourless venom therefore has no protective power. It provokes neither necrotic nor haemorrhagic reaction, but is simplified practically to a neurotoxin. *C. W.*

PEPEU (Francesco). Ulteriori ricerche sugli ofidi velenosi dell' A.O.I. [**Recent Work on the Poisonous Snakes of Italian East Africa.**]—*Boll. Istituto Sieroterap. Milanese.* 1939. Jan. Vol. 18. No. 1. pp. 1–8. With 4 figs. on 2 plates. [16 refs.] French summary (7 lines).

The author studied the venom of *Atractaspis microlepidota* Magrettii obtained from the dried gland, which is a long delicate structure (up to 30 cm. in length) with an ampulla close to the base of the fang. The venom has a powerful toxic action, about twice as strong as that of *Vipera ammodytes* and may be lethal to man, especially if introduced into a vein by the long slender fangs. In animals respiration is paralysed, the venom being rich in neurotoxin and poor in enzymes. Haemolysis and coagulation of citrated plasma are not produced *in vitro*.

Two monovalent sera neutralize this venom, that prepared against *Naja nigricollis* and that against *V. ammodytes*. Polyvalent antivenene contains the former and it is unnecessary to prepare serum directly against *A. microlepidota*.

Psammophis sibilans was also studied and although its venom possesses neurotoxic properties, the small quantities available in the glands and smallness of the fangs, set far back, render this snake comparatively harmless to man. *C. W.*

Iyengar (N. K.), Sehra (K. B.) & Mukerji (B.). **Studies on the Protease of Cobra Venom.**—*Indian Jl. Med. Res.* 1938. Oct. Vol. 26. No. 2. pp. 487–492. With 2 graphs.

The enzymes in cobra venom which are responsible for its curative effects on the cells of mouse tumours are phosphodiastase, proteolysin, haemolysin and possibly haemorrhagin. The proteolytic enzyme, which appears to belong to the group of tryptases, probably digests the extra proteins produced in the blood by the presence of venom. The earliest stages of protein breakdown by this enzyme complex have not been recorded.

A concentration of 0·05 per cent. venom was chosen for study in the digestion of casein, as this is the lowest concentration with measurable enzyme activity. At this strength the amount of casein digested is proportional to the square root of the duration of digestion in hours. Below this concentration the enzyme is gradually inactivated during digestion, possibly by a trypsin inhibitor, which appears to be in the venom. In therapeutic use, the low concentration of the venom combined with the presence of this inhibiting agent may be responsible for the selective digestion of tumour cells which occurs.

The optimum *p*H for the digestion of casein appears to be about 8·0, but the protease is inactivated by HCN and KCN. *C. W.*

Ghosh (B. N.), De (S. S.) & Bhattacharya (D. P.). **Investigation on the Isolation of the Active Principles from the Venoms of** *Bungarus fasciatus* **and** *Vipera russellii*.—*Indian Jl. Med. Res.* 1939. Jan. Vol. 26. No. 3. pp. 753–758.

The techniques detailed in this paper cannot be abstracted and should be consulted in the original. The following are the authors' conclusions:—

"1. A very concentrated preparation of the active principles of Russell's viper venom has been obtained by fractional precipitation with sodium sulphate followed by adsorption on and elution from the surface of aluminium hydroxide C. For the same nitrogen content the activity of the neurotoxin in this sample was about 7·8 times greater than that in the crude venom.

"2. A very active sample of the neurotoxin of *B. fasciatus* venom free from haemolysin has been prepared by fractional precipitation with sodium sulphate, followed by adsorption on and elution from the surface of tungstic acid. For the same nitrogen content the activity of the neurotoxin in this sample was about 5·3 times greater than that in the crude venom.

"3. It has also been found that by repeated treatment of a solution of *B. fasciatus* venom with ferric hydroxide in presence of 0·75 per cent. NaCl and at pH 7·2, a sample is obtained in which the activity of the neurotoxin for the same nitrogen content is about 9 times greater than that in the crude venom. The neurotoxin sample, however, contains some haemolysin." *C. W.*

Slotta (K. H.) & Fraenkel-Conrat (H.). **Two Active Proteins from Rattlesnake Venom.** [Correspondence.]—*Nature.* 1938. July 30. Vol. 142. No. 3587. p. 213. With 1 fig.

The dry venom of *Crotalus t. terrificus* contains about 60 per cent. of a neurotoxic substance and about 10 per cent. of a blood coagulating principle. The latter shows all the proteolytic as well as all the coagulating activity of the crude venom and though it cannot be

obtained in a homogeneous or crystalline state it can be concentrated tenfold. The authors believe that the proteolytic and coagulating activities are due to the same protein, which, when highly purified, shows the properties of an albumin.

The neurotoxic principle can be obtained pure and is the first proteinic toxin which has so far been crystallized. It contains the whole neurotoxic and haemolytic activities of the venom, which have hitherto been attributed to two different substances. The authors name this substance crotoxin. It contains 4·0 per cent. of sulphur and the molecular proportion of methionine to cystine is exactly 1 : 6.

C. W.

Ghosh (B. N.) & De (S. S.). **Proteins of Rattlesnake Venom.** [Correspondence.]—*Nature.* 1939. Mar. 4. Vol. 143. No. 3618. pp. 380–381.

By dissolving 100 mgm. of venom of *Crotalus terrificus* in 10 cc. water, adjusting to *p*H 7·0–7·2, saturating with sodium chloride overnight at 6°C., separating the precipitate by centrifugation, and washing again in saturated sodium chloride, the authors found the precipitate to contain 8–10 per cent. of the total haemolytic activity, and only 2–2·5 per cent. of the total neurotoxic activity of the original venom. This proportion of 4 : 1 between the two is much higher than in the original venom and the two activities are therefore due to two different substances. The crystalline substance obtained by Slotta and Fraenkel-Conrat [see above] was therefore a mixture of at least two different proteins.

Similarly, the haemolysin and neurotoxin of *Naja naja* venom have been separated. *C. W.*

Vellard (J.). Propriétés du venin des principales espèces de serpents du Venezuela. [**The Properties of the Venom of the Principal Snakes of Venezuela.**]—*Ann. Inst. Pasteur.* 1938. May. Vol. 60. No. 5. pp. 511–548.

Following his previous work in which he described differences existing between the venoms of specimens of *Bothrops atrox* from different parts of South America [this *Bulletin*, 1937, Vol. 34, p. 656], the author has made a study of *Crotalus terrificus*, *Lachesis muta*, *Bothrops atrox*, *Bothrops nasuta* and *Elaps lemniscatus*, in the same way. The methods employed were similar to those used previously, and the properties of the venoms under the headings of coagulant, anti-coagulant, haemolytic, anti-haemolytic, anti-complementary, proteolytic and necrosing, were examined separately *in vitro* and *in vivo*. Determination of the susceptibility of the principal laboratory animals was made.

The venoms of *L. muta* and *B. nasuta* were constant in all the specimens examined, such differences as were found were entirely quantitative and could be accounted for by individual variations. The results with the venom of *E. lemniscatus*, though indicating that differences were not appreciable, could not be regarded as conclusive on account of the small quantities available for testing. The venoms of *C. terrificus* and *B. atrox*, however, showed clear differences between the specimens from different parts.

The venoms were tested *in vivo* for their actions on pigeons, rabbits, guineapigs, dogs and lizards, and the intravenous, intramuscular, intradermal and intraperitoneal routes were used. *In vitro* experiments were employed to test the effects on the blood.

The important conclusions were as follows :—

The venom of *C. terrificus* (Venezuela) possesses in a high degree all the characteristic properties of the venoms of the Crotalines of South America. The specimens from the South (Argentine, Brazil and Paraguay) show a slightly stronger neurotropic action, but are almost devoid of proteolytic properties. Hence the absence of local lesions. Specimens from Central America, especially of *C. terrificus durissus*, show greater proteolytic action than those from Venezuela, but their toxic action is much less strong. The venom of the Venezuelan *C. terrificus* appears therefore to be intermediate between the two extremes, and in this respect is comparable with the morphological characters of the snakes, which are transitional between the southern types and the Central American *C. terrificus durissus*.

The venom of the specimens of Venezuelan *Bothrops atrox* showed, *in vitro*, strong coagulant and haemolytic properties but little action on proteins. *In vivo* its toxicity was found to be very high, but local necrosis did not usually follow the extensive haemorrhagic oedema produced round the injection. These properties differentiate this venom from that of the *B. atrox* of Brazil which is essentially proteolytic and necrosing, but has little haemolytic and toxic action ; and from that of Costa Rica which is less haemolytic. The *Fer de lance* of Martinique produces a venom having less coagulant power but with stronger haemolytic and necrosing effect.

Antiserum prepared from the Brazilian *C. terrificus* was found to be ineffective against the proteolytic and haemolytic action of the Venezuelan type. Polyvalent antiserum prepared from the Brazilian *B. atrox* was much more effective against the Venezuelan *C. terrificus* than was the homologous *C. terrificus* antiserum prepared from Brazilian material.

These results confirm the necessity for preparing antivenenes from the venom of snakes obtained in the area for which the serum is intended. *C. W.*

Duran-Reynals (F.). **A Spreading Factor in Certain Snake Venoms and its Relation to their Mode of Action.**—*Jl. Experim. Med.* 1939. Jan. 1. Vol. 69. No. 1. pp. 69–81. [13 refs.]

Spreading factor has been demonstrated in normal mammalian tissues, especially testis, in malignant tissues, leech extracts, certain bacteria and in snake venom. The author has investigated the properties of this factor in a series of experiments. He found that extracts from the supralabial glands of harmless snakes did not contain it, and that it was more evident in the Viperidae (which have a predominantly local action) than in the Colubridae (which are predominantly neurotoxic).

Although rattlesnake venom when heated to 65 100°C. is largely deprived of its toxicity, the capacity to increase the permeability of the dermis and of the blood capillaries is retained. Heated to 75° C. it enhances both bacterial and virus infections when a mixture of the venom and emulsions of these is injected intradermally. Both the

toxic factor and the spreading factor are neutralized by specific antiserum, *in vitro* as well as *in vivo*.

Little or no spreading factor was found in toad venom, though this is extremely poisonous for both the circulatory and the nervous system. Extracts of non-poisonous insects, *e.g.*, crickets, grasshoppers, dragon-flies, etc., did not contain it, but it was found in extracts of bees, wasps, mosquitoes and especially spiders.

It would appear, in the case of snakes, that a relationship exists between the local tissue action and the spreading factor content, and the author likens the rattlesnake venom, containing the factor, to *Clostridium welchii*, and the toad venom to *Cl. tetani*.

An interesting point is that extracts of the cells of the poison gland of the rattlesnake contain very little toxin or spreading factor, but that both are present in the secretion of the gland. [The work of Castellani this *Bulletin*, 1939, Vol. 36, p. 567 may have some bearing on this point.] *C. W.*

Favilli (G.). I fattori di diffusione: oro natura, meccanismo d'azione, significato. [**Spreading Factors: their Nature, Mode of Action and Significance.**]—*Boll. Istituto Sieroterap. Milanese.* 1938. Nov. Vol. 17. No. 11. pp. 711–714. German summary (5 lines).

A physiological solution injected into the skin behaves like liquid dropped on writing paper; if it contains the spreading factor it behaves like liquid dropped on blotting paper.

Tumours are especially rich in spreading factor and it is contained in various organs. The intensely rapid action of snake venom is due to it. The diffusion of scorpion venom is so rapid that if injected into the skin in a dilution of 1 in 160,000 no bleb is formed and dispersion is immediate.

Antivenene neutralizes, but in an incomplete manner, the spreading factor of the homologous venom. Anti-viper serum, however, does not neutralize the factor in crotaline or in cobra venom. The spreading factor is antigenic and specific. A spreading factor is present in certain micro-organisms (staphylococci, streptococci, pneumococci) and in the exotoxins of the gas gangrene group, but cannot be identified with the endo- or exotoxins. The existence of a single uniform factor in venoms cannot be substantiated. The factors have been considered to be proteins but the author has succeeded in partially separating them from the proteins in the case of the testicular factor. They resist drying.

The factors act only on collagenous connective tissue and probably therefore on the capillaries and lymphatics, and exert an influence on the exchange between connective tissue and the capillaries and lymphatics. *C. W.*

Vellard (Jehan). Variations de la résistance globulaire *in vivo* sous l'influence des venins de serpent. [**Variations in Red Cell Resistance under the Influence of Venom** *in vivo*.]—*C. R. Acad. Sci.* 1939. Feb. 27. Vol. 208. No. 9. pp. 669–671.

A distinction must be made between resistance to venom haemolysins and resistance to mechanical action or hypotonic solutions. Coagulant and non-coagulant venoms have different effects.

After intravenous injection of haemolytic but non-coagulant venom (Naja, Elaps) there is immediate and massive destruction of red cells, which are also immediately very susceptible to haemolysis by shaking or hypotonic solutions. This susceptibility lessens within half an hour, but not completely. On the other hand the resistance of the cells to haemolysin is almost at once augmented after a very brief preliminary fall. Similar but slower actions are seen after intramuscular injection. Haemolytic and coagulant venoms (Bothrops, Crotalus) raise the cell resistance to haemolysins more markedly still, and the susceptibility to haemolysis by shaking or hypotonic solutions is in direct relation to the haemolytic action of the venom.

The reaction to haemolysin is complex. The first brief phase is one of susceptibility to the haemolysin, followed by a phase of incapacity for reaction with the haemolysin, although susceptibility to shaking, etc., remains. It is probably therefore rather an interference with the normal reactions of the cells than a true increase of resistance. *C. W.*

VELLARD (J.). Variations géographiques du venin de *Crotalus terrificus*. [**Geographical Variations in the Venom of** *C. terrificus*.]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 5. pp. 463–464.

The venoms of snakes of the same species may vary between individuals, according to season, or by geographical distribution. The first variations are slight, the second well known but the third have not been widely recognized although they are the most profound and have given rise to divergent results in research.

C. terrificus was studied by observing shock after intravenous injection, coagulating action, action on complement, and local and necrosing actions and *in vitro* the coagulant, proteolytic and phosphatide-splitting powers. The snakes were obtained from the Argentine, Paraguay, Brazil and Venezuela. The southern venoms are almost without proteolytic or necrosing action but are strongly neurotropic. Venoms from South Brazil are the most coagulant but their haemolytic power is slight; those from the Argentine and Paraguay are less coagulant, more haemolytic and produce more shock. North-east Brazilian venoms are more haemolytic and less coagulant, with feeble proteolytic power. They produce more haemorrhage and violent shock.

Venezuelan crotalines are characterized by strong proteolytic action *in vitro*, the production of haemorrhagic oedema and local necrosis. The neurotropic action is slight, but haemolysis and the production of shock are marked. Central American *C. terrificus durissus* has stronger proteolytic action than the Venezuelan species, but neurotropism is slighter.

Thus the properties of the venom of *C. terrificus durissus* change from the proteolytic but little neurotropic northern type to the slightly proteolytic but intensely neurotropic type of southern Brazil and the Argentine. The regional variations do not depend on climate or local factors. Similarly the venom of *B. atrox* shows variations which are the reverse of *C. terrificus*.

From the practical point of view it is necessary to prepare antivenenes for the local species. [See also this *Bulletin*, 1938, Vol. 35, p. 431, and VELLARD above.] *C. W.*

Césari (E.) & Boquet (Paul). Sur le mécanisme de la détoxication du venin de *Vipera aspis* var l'aldéhyde formique. [**The Mechanism of the Detoxication of the Venom of** *V. aspis* **by Formaldehyde.**]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 1. pp. 19–23.

It has been shown [this *Bulletin*, 1931, Vol. 28, p. 549, 1934, Vol. 31, p. 103] that the addition of 3 to 10 parts per thousand of formaldehyde to snake venom causes, in a few weeks, attenuation of the toxic action without alteration of antigenic power. The authors have studied this effect with reference to the components of the venom of *V. aspis*. They added 2, 4 and 6 parts per 1,000 of 40 per cent. formaldehyde to solutions of 10 mgm. venom per cc. physiological saline. This mixture was incubated at 37°C. and tested at intervals on rabbits, guineapigs, citrated plasma and washed horse erythrocytes in the presence of normal horse serum ; results were compared with those obtained with pure venom.

Toxicity was attenuated very rapidly, in 24–48 hours, especially with 6 per 1,000 formaldehyde, when tested by intravenous injection in rabbits ; more slowly when tested subcutaneously in mice and guineapigs (2 weeks). Coagulation was completely inhibited at 48 hours with 6 per 1,000 and at 72 hours with 4 per 1,000. Haemolytic power, however, was only slightly affected after 15 days by 6 per 1,000. The action of formaldehyde is therefore selective. *C. W.*

Boquet (Paul). Sur le rôle du cuivre dans l'atténuation du venin de vipère (*Vipera aspis*) par l'eau oxygénée. [**The Rôle of Copper in the Attenuation of the Venom of** *V. aspis* **by Hydrogen Peroxide.**] —*C. R. Acad. Sci.* 1939. Mar. 6. Vol. 208. No. 10. pp. 770–772.

A solution of viperine venom (1 in 500) in distilled water mixed with an equal quantity of hydrogen peroxide (100 volumes diluted 1/100, 1/200 . . . . etc.) and kept for 20 hours at 37°C. is harmless to rabbits in 5 times the normal lethal dose. The hydrogen peroxide was prepared with the same distilled water, in which traces of copper from the still were found. On substituting water distilled from a glass still there was no attenuation of the venom, but when 1 mgm. per litre of copper sulphate was added, attenuation was again produced. No attenuation was found with copper in the absence of hydrogen peroxide.

The copper probably acts as a catalyst in fixing the oxygen and the experiment shows with what care reagents must be prepared.

C. W.

Boquet (Paul). Sur le rôle de quantités infinitésimales de cuivre dans l'atténuation du venin de vipère (*Vipera aspis*) par l'eau oxygénée. [**The Rôle of Small Quantities of Copper in the Attenuation of the Venom of** *Vipera aspis*.]—*C. R. Soc. Biol.* 1939. Vol. 131. No. 15. pp. 7–10.

In continuation of the experiments in the preceding paper the author found that when a solution of the venom was mixed with hydrogen peroxide in different amounts, and with a solution of 1 mgm. to the litre of copper sulphate, the toxicity decreased in proportion to the concentration of H_2O_2, and to the length of time of contact with the reagents. Control mixtures without copper remained toxic for much

longer, as did those kept at 4°C. than those at 37°C. Concentrations of the copper solutions of less than 1 mgm. per litre were less effective, but those of 2·5 to 5 mgm. were no more effective than the 1 mgm. solution.

Therefore it is seen that H_2O_2 at 37°C. rapidly eliminates the toxicity of the venom when the active oxygen is fixed to the venom through the intervention of copper, which acts as a catalyst; and that the reaction is in proportion to the oxygen available. *C. W.*

Finlayson (M. H.) & Grobler (J. M.) **A Provisional Stable Standard for Cobra Antivenene, and its Practical Application.**—*South African Med. Jl.* 1939. Jan. 14. Vol. 13. No. 1. pp. 9–12.

The method of preparation of a dry stable Provisional Standard Serum for cobra antivenene is described. The serum used was that prepared by the South African Institute for Medical Research. Quantities of 26 cc. were dried over P_2O_5 and dissolved in 20 cc. of 66 per cent. glycerol saline before use. The Provisional Standard Unit is ten times the amount required to neutralize the M.L.D. (for mice) of cobra venom: this unit is contained in 0·325 cc. of the serum, and in 0·25 cc. of the glycerol solution. No loss of potency was found in the dissolved dried serum, and dried serum kept in the dark at −2° to −4°C. for 12 months was fully active.

Great variation was found in the potency of commercial antivenene preparations sold in the Union. The authors, therefore, suggest that all cobra antivenenes of unknown potency should be tested against the Provisional Standard Serum which, preserved in a dry state, is very stable. *C. W.*

Ipsen (Johs.). **Progress Report on the Possibility of Standardising Anti-Snake-Venom Sera.**—*Bull. Health Organisation.* (League of Nations.) 1938. Oct. Vol. 7. No. 5. pp. 785–801. With 3 figs.

The European vipers were chosen for this work, especially *V. aspis* and *V. ammodytes*. The antigenic action of the venom is not entirely specific for the zoological species, individuals of the same species do not produce quite identical venoms, and indeed, it has been stated that different samples of venom from the same *individual* are not identical. Before standardizing serum, therefore, it is necessary to standardize venom, and this should be done by collecting samples from as many individuals as possible.

In an assay it is important to determine the relation between the antitoxin and the venom at different levels. For instance, 1 m.l.d. only requires partial neutralization to be ineffective. A modification of the Zabreb method is therefore suggested, which involves the use of about 20 mice, which are given intravenous injections of venom and serum, freshly mixed, in various doses.

Four commercial sera were found to neutralize measurable amounts of venom, but the strengths of the sera varied according to the venom used. The sera are more potent when tested with the venom of the species used in preparation. In the intracutaneous and intravenous tests in rabbits, the venoms are neutralized by much smaller amounts of serum than in the mouse intravenous test, and the relative strengths of the sera vary according to the test animal and the route of injection.

The author advises that sera should be marked according to the venoms used in preparation, since there are well marked geographical localizations of the various species in Europe. He suggests that the mouse intravenous test should be used rather than tests on rabbits.

C. W.

BOQUET (Paul). Immunité antivenimeuse spécifique et paraspécifique. [**Specific and Paraspecific Immunity against Venoms.**]—*Rev. d'Immunologie.* Paris. 1938. July. Vol. 4. No. 4. pp. 359–370. [26 refs.]

Recent researches have supported the opinion expressed by CALMETTE, that the specific nature of antivenenes is not so strict as was thought. CÉSARI and the author have shown that a bivalent serum prepared against *B. arietans* and *S. haemachates* (neither of which contains a coagulant principle) can neutralize *in vivo* and *in vitro* the coagulating effect of the venoms of *V. russelli*, *C. cornutus* and *V. aspis*, but has almost no action against the coagulating principle of *C. terrificus* and *B. atrox*. It also protects against the anticoagulating principles of *B. arietans*, *S. haemachates*, *N. flava, and N. tripudians*. The venom of *V. lebetina* of Africa is better neutralized by anticobra than antiviper serum.

The paraspecific action of serum seems to result from antibodies capable of combining with group antigens, but, as VELLARD [see this *Bulletin*, 1937, Vol. 34, p. 656] has pointed out, members of the same species, but from different districts, elaborate different antigens. In spite of this, however, members of different species elaborate certain antigens which are identical, and which have strictly specialized properties. These common antigens are the group antigens, and should be taken into account in the preparation of antivenenes [this *Bulletin*, 1937, Vol. 34, pp. 641, 646] by making use of those venoms which contain the antigens most commonly found in the district in which the serum is to be used.

The author makes a plea for uniformity in methods of titration and systems of units. A useful table of the actions of common venoms is given.

C. W.

D'ABREU (A. R.). **Poisoning by Bite from *Bungarus caeruleus* with Recovery.**—*Indian Med. Gaz.* 1939. Feb. Vol. 74. No. 2. pp. 94–95.

The patient, a juggler who used snakes in his acts, but who could not distinguish between the poisonous and non-poisonous kinds, picked up what he later identified as a krait (*Bungarus coeruleus*) which bit him in the hypothenar eminence. He sucked the wound and ligatured his wrist. No effects were felt for some hours, but 13 hours after the bite he was admitted to hospital with fully developed symptoms of colubrine venom poisoning. Anti-serum C (Pasteur Institute of Paris) labelled as specific against the venoms of *Naja* and *Bungarus* snakes was given intravenously about 28 hours after the bite (it was not available earlier). Cyanosis and respiratory paresis, with salivation, indistinct speech, ptosis, paresis of the limbs, diminished tendon reflexes (but no loss of tactile sensation) and great prostration were found, but there was no local reaction. Signs of pneumonic

consolidation appeared but rapidly cleared and the patient recovered, slowly at first.

The amount of venom available in the krait is about three lethal doses for man, but possibly the thick epidermis of the palm of the hand prevented effective penetration by the small and fine fangs, which are also, in some instances, not completely tubular and may thus permit escape of the venom. Recovery from the bite of the krait is rare. *C. W.*

KNABE (Kurt). Schlangenbiss eines Kamerunnegers durch grüne Baumschlange (*Dipholidus typus*). [**The Bite of the Green Tree Snake** (*Dipholidus typus*).]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1939. Apr. Vol. 43. No. 4. pp. 173–174.

The symptoms in a native in the Cameroons bitten by this snake were swelling of the bitten hand and arm, pain, vomiting, rapid and weak pulse, and headache. Bleeding continued for some days from an incision made at the site of the bite and haemorrhagic necrosis of the edges took place. Ecchymoses appeared in the mouth but no blood was found in the vomit or stool. Erythrocytes diminished to 2·8 millions and haemoglobin to 30 per cent.

Treatment was symptomatic but in the absence of specific antiserum 10 cc. anti-cobra serum was given. The patient was very ill for about a week, when improvement started.

The effect of the venom is comparable with that of the South American snakes of the genus Lachesis, and death results from vaso-motor paralysis and haemorrhages in the internal organs due to lysis of the capillary walls by a toxic haemorrhagin. *C. W.*

ALLEN (Frederick M.). **Mechanical Treatment of Venomous Bites and Wounds.**—*Southern Med. Jl.* 1938. Dec. Vol. 31. No. 12. pp. 1248–1253. [14 refs.]

The author states that all authorities are agreed as to the uselessness and actual harmfulness of the injection of permanganate and all other chemical solutions designed to destroy or neutralize venom. There is no method of occlusive ligation which affords the slightest protection or benefit against venom in animal experiments. Successive tight ligations and releases are effective if a rapidly absorbed poison such as strychnine is injected, but are useless for snake venom, which is usually absorbed slowly.

The Jackson treatment [see this *Bulletin*, 1929, Vol. 26, p. 273] consists in the use of a very lightly applied tourniquet just enough to obstruct the lymph circulation and not the free venous return. Under local anaesthesia a rather large crucial incision is made at the site of the fang marks, and a ring of smaller cross incisions about $\frac{1}{8}$ inch wide by $\frac{1}{4}$ inch deep is made round the advancing edge of the swelling. Suction over these with a special form of cup is employed to draw out large quantities of fluid, and the flow is further increased by the injection of several hundred cc. of 1 per cent. salt solution into the incisions. Suction is continued for half to one hour, then repeated for 20 minutes hourly for 10 to 15 hours.

This treatment has been successful in experimental work with dogs, and the fluid removed by the suction has been shown to be fatal to

other dogs. It is perhaps best adapted to the venoms with powerful local action.

This treatment is simple and should be used even if antivenene is available, and certainly if it is not. Excision is only useful if considerable in extent. Amputation may be necessary and the use of an occlusive tourniquet should be reserved for control of haemorrhage, for gaining time preliminary to amputation or for use with local refrigeration, another method of gaining time.

The author considers that Jackson's method deserves a thorough trial in the tropics. *C. W.*

SERGENT (Etienne). Iconographie des scorpions de l'Afrique du Nord. [**Iconography of North African Scorpions.**]—*Arch. Inst. Pasteur d'Algérie.* 1938. Dec. Vol. 16. No. 4. pp. 513–522. With 5 coloured plates.

The differentiation of species of scorpions by colour characteristics is of considerable importance, and this cannot be effected by monochrome photographs. Illustrations in colour are therefore here reproduced of *Prionurus australis* (adult and young), *P. liouvillei*, *Buthus occitanus* and *Heterometrus maurus*, together with brief notes concerning toxicity and habitat. [The coloured plates are beautifully executed and reproduced.] *C. W.*

SERGENT (Etienne). Venin de scorpion et sérum anti-scorpionique. [**Scorpion Venom and Antivenene.**]—*Arch. Inst. Pasteur d'Algérie.* 1938. Sept. Vol. 16. No. 3. pp. 257–278.

The author gives the details of 12 cases of fatal scorpion sting in Algeria and Morocco. In Algeria the dangerous scorpion is *Prionurus australis*, in Morocco *P. liouvillei*, and one person died from the sting of the usually harmless *Buthus occitanus*.

Serious symptoms do not usually appear until two hours after the sting. They consist of violent pain, vomiting, vertigo, profuse sweating and sensation of cold, cardiac weakness, dyspnoea, cyanosis and coma.

Serum is prepared from horses and donkeys, and should be given as soon as possible in doses of from 10 to 50 cc. for adults. [The dose advised for children is not given, but in 6 children detailed it varied from 10 to 50 cc. These children all died. Does the rule that the smaller the animal the larger should be the dose hold good for scorpion antivenene ?]

In 33 patients whose condition was regarded as desperate, 26 were saved by serum. In 8 in whom the serum was injected soon after the sting there were no deaths. In 66 with definite but not grave symptoms there were no deaths. At Bou Sâada in 1932–1934, when no serum was available, there were 22 deaths. In 1936 and 1937, when serum was used there was 1 death in 32 stung. At El Kantara from 1929 to 1935, when serum was not available, there were 12 deaths. In 1936 and 1937, when serum was used, there were no deaths in 51 stung, 14 of whom had grave symptoms.

Animals immunized against *P. australis* are protected against other North African species [see also this *Bulletin*, 1937, Vol. 34, p. 727].

C. W.

PALLARY (Paul). Sur des scorpions de la Berbérie de la Syrie et du Congo. [**Scorpions of Northern Africa, Syria and the Congo.**]—*Arch. Inst. Pasteur d'Algérie* 1938. Sept. Vol. 16. No. 3. pp. 279–282.

KENT (Melvin L.) & STAHNKE (Herbert L.). **Effect and Treatment of Arizona Scorpion Stings.**—*Southwestern Med.* 1939. Apr. Vol. 23. No. 4. pp. 120–121, 124.

More deaths have resulted from scorpion stings in Arizona since 1929 than from any other venomous animal. The effects of the stings of *Vejovis spinigerus*, *Hadrurus hirsutus* and *Centruroides sculpturatus* on rats were studied, the two former being relatively harmless, the last being fatal. In man the effects of the sting of *C. sculpturatus* are invariably more pronounced in children than in adults and are almost always fatal to those under 1 year of age. The child cries out with pain, but there is little sign of the sting. Restlessness follows, with rigidity of the abdominal muscles, tonic contractions of arms and legs and salivation. Temperature may reach 104°F. Cyanosis and difficulty of respiration, involuntary urination and defaecation may follow and death supervene, apparently from exhaustion. If recovery takes place there is numbness at the site of the sting and possibly temporary uselessness of the limb.

In treatment barbiturates and bromides, the latter in large doses, are valuable, but morphine should be used only with extreme caution and has not been found useful in the usual dosage. Atropine may be given for severe pulmonary oedema and compresses of fairly strong ammonium hydroxide solution are useful if applied within a few minutes of the sting. Results with scorpion serum are encouraging and the author believes that no death has occurred when it has been used. One case is quoted in which the serum produced dramatic improvement within a few minutes of intramuscular administration.

C. W.

VARELA (Gerardo). El cloruro de calcio en la intoxicación por la toxina del alacrán de Guerrero (*Centruroides limpidus* Karsch). [**Calcium Chloride in Scorpion Poisoning.**]—*An. Escuela Nac. Ciencias Biol.* Mexico. 1938. Oct.–Nov.–Dec. Vol. 1. No. 1. pp. 133–134. English summary (2 lines).

Mice of 18 to 20 gm. tolerate the injection of 0·0187 gm. calcium chloride, and this dose was mixed with the m.l.d. (0·0028 gm.) of the toxin of *Centruroides limpidus* Karsch and injected. Death occurred in some of the animals, but much less early than in the controls. Similarly, mice given calcium chloride after the appearance of symptoms following the administration of the m.l.d. of scorpion venom died, but much later than the controls. In the treated animals death was delayed up to the following day, controls died in about 30 minutes.

Calcium chloride may therefore be useful in the treatment of sublethal scorpion poisoning. [No figures are given.] *C. W.*

DE MAGALHÃES (Octavio). **Scorpionism.**—*Jl. Trop. Med. & Hyg.* 1938. Dec. 15. Vol. 41. No. 24. pp. 393–399. With 1 chart & 1 fig.

The common scorpions of Minas Geraes are *Tityus bahiensis* and *T. serrulatus*. The venom can be kept dry at 0°C. for eight months with the loss of only half to quarter of its value.

The author gives three general laws. 1. The poison is toxic to the nervous system. 2. An animal is only absolutely immune when its central nervous system is immune. 3. The poison affects principally the neurones united in centres. But in the poison there are also haemorrhagins, leucocytolysins, agglutinins and haemolysins. The symptoms exhibited depend upon the dose and its proportion to the weight of the patient, the kind of scorpion and the time of the year, toxicity being greater in August, September and October than at other times. The resemblance of the symptoms to those of acute syringobulbia is emphasized. The long account of the symptomatology given should be read in the original.

In Brazil 6,668 cases of scorpion poisoning are reported, of which 237 were fatal. The author mentions a local treatment with the juice of the leaves or tubercle of the dahlia, which has some neutralizing action, but serotherapy is the only effective measure. The deaths in a series [numbers not given] were 1·81 per cent. with serum treatment, 42 per cent. without. *C. W.*

DE MAGALHÃES (Octavio). **The Scorpionic Syndrome.**—*Jl. Trop. Med. & Hyg.* 1939. Jan. 2. Vol. 42. No. 1. pp. 1–5.

The venom of specimens of the genus *Tityus* contains especially a neurotoxin, which is the killing agent. The author emphasizes the action on the nervous system, the characteristic effect of which is an alteration of the superficial sensibility to pain. Painful hyperaesthesiae may be confined to the area of the sting or may radiate along the limb affected and may be exceedingly violent. Numbness, itching or pricking sensations may be felt.

The venom of the Brazilian species of *Tityus* has a distinct and constant action upon the neurones of the cerebral cortex of laboratory animals. In man, generalized convulsions, disturbances of speech, delirium and certain states of aggressiveness also indicate an action on the cortical neurones of the frontal lobes. There is an action on the cerebellum and on the medulla oblongata. The author gives a long table comparing the symptoms of severe scorpionism with those of syringobulbia. The resemblance is close. Attention is drawn to the fact that scorpion venom is not primarily of a digestive nature as is the venom of the Ophidia in general. *C. W.*

BARROS (Evandro da Fonseca). Contribuição ao conhecimento de lesões nervosas centrais provocadas pelo veneno escorpiônico. [**Lesions of the Central Nervous System due to Scorpion Venom.**]—*Mem. Inst. Biol. Ezequiel Dias.* Belo Horizonte. 1937. Vol. 1. 300 pp. With 3 text figs. & 128 figs. on 66 plates. [40 refs.]

VARELA (Gerardo) & SÁNCHEZ POSADA (Enrique). Anaponzonãs del veneno del alacrán de Guerrero (*Centruroides limpidus* Karsch). [**Detoxification of Scorpion Venom.**]—*An. Escuela Nac. Ciencias Biol.* Mexico. 1938. Oct.–Nov.–Dec. Vol. 1. No. 1. pp. 135–137. English summary (8 lines).

The addition to scorpion venom of formaldehyde (40 per cent.) to a concentration of 4 per cent. renders it non-toxic to mice after 7 days at 37°C., and at the same time deprives it of antigenic properties. Treatment with equal quantity of sodium ricinoleate in a concentration of 1 in 500 does not detoxify the venom as it does that of

V. aspis. Lugol's solution in a concentration of 1 in 10 detoxifies scorpion venom in 24 hours in the refrigerator, but destroys the antigenic power.

The authors therefore recognize a distinction between snake toxins and scorpion venom. *C. W.*

Finlayson (M. H.). **Some Properties of the Venom and Arachnolysin of** *L. indistinctus*.—*South African Jl. Med. Sci.* 1937. Oct. Vol. 2. No. 4. pp. 151–155.

Four matters of research were carried out by the author and described in this all too brief paper :—

1. The thermostability of the venom of *Latrodectus indistinctus*. This was determined by heating the venom for 30 minutes at 50°, 55°, 60°, 70° and 80°C. and injecting it intravenously into mice for which the control m.l.d. was 0·05 mgm. Heating to 50°C. had little effect ; at 55°C. the venom was weakened and at 60°C. totally destroyed.

2. The action of certain chemicals on the venom. The toxicity was removed by 0·01 per cent. gold chloride or potassium permanganate or of 40 per cent. formalin [? formic aldehyde ; formalin is the name usually given to 40 per cent. solution of formaldehyde]. Fractionation by means of CO_2 results in a more highly toxic insoluble and less toxic soluble fraction.

3. The haemolytic properties of the venom. It was found not to haemolyse human or guineapig's corpuscles, even when guineapig serum was added, but it would haemolyse rabbit cells readily, sheep cells slightly only.

4. The haemolytic properties of arachnolysin, that is a solution of the dried body of the insect. This differed in several respects from the venom. It readily haemolysed human corpuscles, and of the rabbit (in this resembling the venom) ; it would not affect sheep cells unless guineapig serum was added. As for guineapig red cells, these were haemolysed by the arachnolysin, but not if guineapig serum, heated or unheated, was added [see also this *Bulletin*, 1937, Vol. 34, p. 732]. *H. H. S.*

Shapiro (H. A.), Sapeika (N.) & Finlayson (M. H.). **Pharmacological Actions of the Venom of** *Latrodectus indistinctus*.—*South African Jl. Med. Sci.* 1939. Apr. Vol. 4. Nos. 1 & 2. pp. 10–17. With 8 figs.

Poisoning by the bite of *L. indistinctus*, the Knoppie spider, is far from uncommon in South Africa [see this *Bulletin*, 1937, Vol. 34, pp. 732–3]. In this article the authors record the results of their experimental work with the venom on the heart, respiration, intestine and skin of frogs, rabbits and cats. It was found to have a depressant effect on the cardiac musculature and since the effect is not abolished by atropine the action is probably directly on the muscle. These depressant cardiac effects are associated with rise in blood pressure which, however, sinks after 2–3 minutes and there is increase also in intestinal and skin volume, suggesting that the crude venom contains more than one toxic principle. Some of the effects may be due to a histamine-like substance released in the tissue (as in the case of cobra venom), though none such was detected. The action on respiration is also depressant and death is due to this combined effect on the respiratory and vascular systems. *H. H. S.*

MACKINNON (Juan E.). Accidentes poco conocidos producidos por picaduras de arañas. Arañismo cutáneo-gangrenoso y hemolítico. [**Little-known Symptoms in Bites by** *Latrodectus mactans*.]—*Arch. Uruguayos de Med., Cirug. y Especialidades.* 1938. Nov. Vol. 13. No. 5. pp. 575–580. [16 refs.]

The symptoms usually resulting from bites by the Black Widow spider are of a neurotropic nature [see this *Bulletin*, 1936, Vol. 33, p. 401; 1937, Vol. 34, p. 728]. Four cases are recorded here, in three of which there was local necrosis and a gangrenous condition produced, in one with jaundice, and in the fourth (third in the order described) marked systematic disturbance with haematuria, delirium, coma and death in 36 hours; this was a boy of 11 years bitten in the right subclavicular region by a spider which was found under his shirt.

H. H. S.

SMITH (Donn) & D'AMOUR (Fred E.). **Black Widow Antivenin Production in Rabbits.**—*Proc. Soc. Experim. Biol. & Med.* 1939. Apr. Vol. 40. No. 4. pp. 686–687.

Antiserum against the Black Widow spider is usually prepared in the sheep and requires about 3,000 spiders for each animal. Loss of a sheep is therefore a serious matter. The authors attempted the production in rabbits. The venom glands were removed and macerated in saline, débris was filtered off through cotton, and the rabbits, of about 4 kgm., were immunized by subcutaneous injections on alternate days; for the first 2 weeks one quarter of the venom of one spider was given, for the next 2 weeks one spider, for the next 2 weeks two spiders, and for the last 5 weeks eight spiders at each injection.

Serum at the end of the 5th week showed little or no neutralizing power, but after 11 weeks the results compared reasonably well with those of sheep serum. This finding may be important in the commercial production of antivenene, where only small amounts of readily available serum are desired. *C. W.*

ANCONA (H. L.). Histología de la glándula venenosa de *Crypsidromus breyerii* Becker. [**Histology of the Poison Gland of** *Crypsidromus breyerii* **Becker.**]—*An. Escuela Nac. Ciencias Biol.* Mexico. 1938. Oct.–Nov.–Dec. Vol. 1. No. 1. pp. 107–112. With 5 figs. on 3 plates. English summary (4 lines).

The author describes the anatomy and histology of the spider in considerable detail. There are two types of cells concerned in the production of venom. The first, distributed over the membranous wall, consists of cells of about 60μ in diameter which contain dark granules and glycogen. The cells of the second type, distributed on the fibrous trabeculae which extend inwards from the wall, are from 120 to 130μ in diameter. Nuclei in this type are either absent or pyknotic, the cells are pyriform and contain the substance which constitutes the principal part of the venom, together with mucin. Some of these cells are apparently in a state of rest, others are disintegrating.

The venom of the spider is a mixture of the products of the two types, the first secreting its poison, the second disintegrating to produce it. *C. W.*

Sacchi (P.). Immunité active chez le lapin avec le venin des abeilles. [**Active Immunity in Rabbits against Bee Venom.**]—*Boll. Sezione Ital., Soc. Internaz. di Microbiologia.* Milan. 1938. Oct. Vol. 10. No. 10. pp. 211–213.

Intravenous injection of "Apitoxin Smit," a solution of the venom of 1,000 bees in 100 cc. saline solution, into mice shows that it possesses paralysing and haemolytic actions with the production of methaemoglobin. Intradermally it produces necrosis.

Eight rabbits were given 0·2 cc. of this venom subcutaneously and in the same place, on alternate days during 20 days. Fifteen days after the last injection they, with 6 normal controls, were given minimal haemolysing and necrosing doses, and the flocculation test of Ramon was applied. The results of these three tests showed that antitoxic immunity to the extent of about 25 I.U. per cc. of serum had developed in the injected animals, and none was found in the controls.

C. W.

MISCELLANEOUS.

Bardswell (N. D.). **Tuberculosis in Cyprus. (Final Report.)**—*Tubercle.* 1938. Dec. Vol. 20. No. 3. pp. 97–113. With 2 maps (1 folding) & 1 fig.; 1939. Jan. Vol. 20. No. 4. pp. 165–193. With 11 figs. & 15 charts. [Summary appears also in *Bulletin of Hygiene.*]

This is a report on the second and final year's work undertaken by the late Dr. Bardswell, and on account of the intelligent and careful use of the available methods of investigation, provides a very complete confirmation of the opinions expressed in his first report [see *Bull. of Hyg.*, 1939, Vol. 14, p. 130; this *Bulletin*, 1939, Vol. 36, p. 342].

An intensive survey was made of the town and district of Larnaca, comprising a population of 42,000. The whole school population was tested with tuberculin, and positive reactors were followed up into their homes to find the person responsible for the infection. An enquiry was made into every known case of tuberculosis since 1931, contacts were examined and a systematic study of the death registers was made. As the routine X-ray examination of large numbers of the general population was impossible, it would be difficult to suggest more effective measures than were taken.

The many findings cannot be abstracted in full, but the principal conclusions are that tuberculosis is not so common as was thought (the incidence rate in the Larnaca district is about 3 per 1,000 of the population, the average death rate 0·69); that it is essentially a disease of families; that the Cypriots show high resistance to infection and to the spread of definite disease, with chronic fibrous reaction rather than acute caseation; and that bovine disease does not occur. It seems probable that some degree of inherited resistance is present and that this is aided by the climate and certain common habits such as that of sleeping out of doors in the summer. There is some experimental evidence that the virulence of the tubercle bacilli is normal.

The standard of living is low, but there is no correlation between poverty and tuberculosis incidence, and malnutrition is not an important factor. Malaria plays only a small part in the incidence of

tuberculosis. Contact is most effective where the patient (as is usual) sleeps in the same room as the other members of the family, but even under these conditions may not produce infection if the beds are far apart. Sleeping away from contacts, even though using the same day-time living accommodation, greatly decreases the chance of infection.

A mass of information is contained in this report, with detailed descriptions of the epidemiological findings and conditions of life, and recommendations as to the control of the disease which, in their insistance upon modifications of existing customs rather than radical alterations which would probably antagonize the people, display the wisdom and experience of the author. The untimely death of Dr. Bardswell is a severe loss to the cause of tuberculosis, but in this report he has left a model upon which future investigations may well be based. *C. W.*

Vogel (E.) & Riou (M.). Les maladies épidémiques, endémiques et sociales dans les colonies françaises pendant l'année 1937. Maladies sociales. Tuberculose. [**Epidemic, Endemic and Social Diseases in the French Colonies during 1937. Tuberculosis.**]— *Ann. de Méd. et de Pharm. Colon.* 1939. Apr. Vol. 37. Supplement. pp. 487–506. [Summary appears also in *Bulletin of Hygiene.*]

In French West Africa 5,142 cases of tuberculosis were discovered in 1937, compared with only 1,883 in 1936, but the disparity is probably due to the improved services in the dispensaries, since the proportion of tuberculosis in the total diseases found has hardly changed. Of the whole, 87·6 per cent. were cases of pulmonary tuberculosis. Fibro-caseous disease with frequent extensions is common and the patients are often not seen until the stage is advanced. Treatment is difficult but BCG vaccination is regularly carried out by the maternity staffs. In Dakar 1,563 vaccinations were thus performed. The disease is a serious menace in Dakar and the only certain prophylaxis is isolation in hospital, but since the natives will not accept hospital treatment until a late stage, this is obviously inadequate.

In Equatorial Africa there were 825 cases compared with 1,097 in 1936. In Madagascar there is a special dispensary. Collapse therapy has been given to 59 native patients. In Indo-China the numbers showed an increase to 48,120 and the disease is a great social danger. In Cochin-China there were 14,508 cases and pneumothorax was induced in 213. Other methods of collapse were also tried, and a hospital-sanatorium opened in 1933 has now admitted 388 patients, of whom 133 have died. A preventorium for children has been commenced and 27,903 BCG vaccinations given. In Tonking 23,179 cases were found. At Hanoi there is a special dispensary and 13,410 BCG vaccinations were given. In the Pacific and Atlantic groups the numbers are much smaller, as are the populations concerned.

Tuberculin testing of representative groups of natives was carried out in a number of places. Some of these results have already been abstracted in the *Bulletin of Hygiene.*

It is evident that the French are taking steps to control what is obviously a serious disease in the empire. It is advised that Europeans suffering from tuberculosis should be repatriated from West Africa for treatment. *C. W.*

WILLIAMS (George D.) & APPLEWHITE (Joseph D.). **Tuberculosis in the Negroes of Georgia. Economic, Racial and Constitutional Aspects.**—*Amer. Jl. Hyg.* 1939. Mar. Vol. 29. No. 2. Sect. A. pp. 61–110. With 4 figs. [37 refs.] [Summary appears also in *Bulletin of Hygiene.*]

This is a detailed and careful study of 705 coloured non-tuberculous persons and 138 coloured tuberculous subjects in Georgia, U.S.A., to assess the influence of habitus, race and other factors on the incidence of tuberculosis. It should be read by all interested in the tuberculosis of native races.

The results of an anthropological study, which was very fully carried out, are treated statistically, and the conclusion is arrived at " that the Georgia series is a representative racially mixed Negro sample and that the conclusions drawn from a study of it are based on unbiased, unselected, adequately determined data." There is no doubt that tuberculosis takes a disproportionate toll among the negroes and it has been held that susceptibility is a racial characteristic, and by CARTER that the darker negroes show less resistance than the lighter. The present investigation, however, failed to reveal any difference in incidence or (probably) in resistance in the miscegenetic types studied.

Since the time of Hippocrates it has been seen that tuberculosis is frequently associated with a certain physical habitus. In the present study, in which negroes are compared not with whites but with negro-whites, extensive measurement data (which do not and should not include the changeable feature of body weight) show that the various negro types are indistinguishable in bodily proportions and that the differences between the tuberculous and the non-tuberculous can be explained as effects of the disease and not, therefore, as predisposing factors.

A survey of the socio-economic conditions of the negroes studied brings out the fact that one group, consisting of negroes with a greater degree of white admixture, has an environmental advantage over other coloured people of the community. The reason for this may well be their interest in emulating the white side of their ancestry. At the same time the incidence of tuberculosis in this group is less frequent than in the others. In general it was found that gross overcrowding occurred among the mass of the negroes investigated and that this was related to the economic status. Further, it was shown that tuberculosis was largely a matter of house contact and that overcrowding and contact possibilities were least in the more advantageously situated group referred to above. In this respect, therefore, but not directly, racial mixture plays a part in the epidemiology of the disease.

In discussing prevention and control the authors emphasize the importance of preventing the mass infection which too commonly takes place in such communities and refer to the finding of OPIE that diseased negroes, like other communities whose experience of tuberculosis is of comparatively recent date, " tend to scatter tubercle bacilli in vastly greater number for much shorter periods of time than those affected with the usual chronic type of pulmonary tuberculosis." The incidence of mass infection can be greatly diminished by provision against overcrowding. Free institutional care is often given only to those who show some possibility of improvement, while those with advanced disease are left to spread their infection at home. This

policy attempts to prevent mortality of the individual while permitting morbidity and mortality of the group.

The programme suggested for a campaign to control tuberculosis in the American negroes does not accept the view that in resistance they differ greatly from the whites, and recent experience of collapse therapy supports this conclusion [see also *Bull. of Hyg.*, Vol. 14, p. 128]. It is based on the principle of prevention of mass infection and may be summed up as to " identify the infected, isolate them, and better the living conditions of this population generally." [Presumably by " the infected " are meant those actually diseased. Readers will see the similarity between these basic principles and those advocated in England by Lissant Cox :—" Find, isolate, educate and treat the adult positive case."] *C. W.*

REVIEWS AND NOTICES.

Field (J. W.). **Notes on the Chemotherapy of Malaria.**—*Bull. Inst. Med. Res. Federated Malay States.* 1938. No. 2. pp. vii+180. With 39 figs.

This short, up-to-date publication by an author with large experience, will be welcomed by malariologists. It is based on a series of lectures, delivered in Singapore, at the 4th International Congress on Malariology. The literature on the subject has been widely consulted and quoted with the author's own views. The reader feels that many lacunae in his previous knowledge have been filled up.

There is a brief historical introduction dealing with quinine, the advent of new synthetic drugs and the development of new methods in the treatment of malaria, associated with the use of induced malaria in the treatment of G.P.I. patients. It has now become necessary, as the author points out, to define an antimalarial drug in parasitological terms in order to indicate its range of action. A useful graph indicates the plasmodicidal activity of the better known drugs.

The chemical nature of the chief antimalarials is dealt with in clear and simple fashion, with formulae appended. Emphasis is laid on structure, but their character as bases, with dissociation values and definite combining powers is not touched upon. The discovery that undecamethylene diamidine, an aliphatic compound, has plasmodicidal powers is probably too recent to be included in the text.

The history and use of the principal malaria remedies amongst the cinchona alkaloids is reviewed from all aspects. Cinchona febrifuge and Totaquina receive due mention, as well as the recently synthesized hydro derivatives. Some useful preparations containing quinine or modified quinine are discussed, others are mentioned only to be condemned.

The chapter on plasmoquine, whose unique action on crescents is appraised, deals fully with that drug. English, French and Russian analogues are also structurally represented. The author considers that a satisfactory *in vitro* test for antimalarials has still to be evolved. The reviewer, however, who collaborated in the measurement of inhibitive action on the respiration of isolated monkey parasites by known antimalarial and other drugs, found that this inhibitive action was roughly parallel to therapeutic effect. The use of avian malaria

has also its limitations in drug-testing, as the author states, and actually the above-mentioned amidine was ineffective against *P. relictum* infections of canaries, although moderately active in B.T. and monkey malaria.

The history and use of atebrin is also discussed fully. Evidence is adduced that a combination of atebrin and plasmoquine is not desirable, but favourable reports on atepe tablets have been received from India and elsewhere. Other drugs which have failed to stand the test of experience are briefly described.

Specially valuable are the suggestions outlined for the treatment of malaria in various circumstances. Quinine, plasmoquine and atebrin have all been used successfully in pregnancy complicated by this disease. In some communities B.W.F. has disappeared as the result, it is claimed, of taking small daily prophylactic doses of quinine.

The question of chemoprophylaxis is dealt with from a theoretical and practical standpoint, and indications for its employment outlined. It is still doubtful whether any antimalarial, given in non-toxic doses, can prevent infection following the bite of an infected mosquito. Post-prophylactic recrudescence of attacks is a problem of considerable gravity. The author has serious doubts about the value of attempting to eradicate malaria by drug treatment alone.

The bulk of evidence regarding the influence of chemoprophylaxis on natural immunity suggests that the latter process is slowed down during treatment, but that pre-existing immunity is probably not lost. It is concluded that the interests of scattered populations are probably best served by mutual adjustment between parasite and host so long as life is safeguarded by a judicious use of quinine.

Apart from some minor mistakes in print, such as representing neo-salvarsan with two sodium atoms, the compound C77 with a double-bond in the bridge structure of the piperidine ring, and the Cl. atom by two capital letters, the book is well produced. Schulemann's name is consistently spelt with a single "n."

The appendix contains the 4th General Report of the Malaria Commission of the Health Organisation of the League of Nations, and is most valuable. The reviewer is glad to have had the opportunity of reading this book. *J. D. Fulton.*

Bisquerra (E. D.). **Le traitement du kala-azar.** [Treatment of Kala Azar.]—273 pp. With 13 graphs. [Bibliography.] Algiers: Imp. Navarro.

This book is a thesis presented to the Faculty of Medicine in Algiers and as such is a review of the literature on the subject of its title rather than an account of personal experiences in the treatment of the disease, in fact there is little evidence that the author has had any personal contact with cases or has treated any on his own account. Nevertheless, the literature of the subject, running to over three-hundred and fifty references, has been carefully reviewed and various conclusions have been drawn. The chief of these appear to be that, once diagnosed, the disease must be treated by a short and intensive course of some antimony derivative and that after the course the case must be watched for a month before deciding that further treatment is not necessary. The clinical course alone will decide this point. For a further period of five months the patient must be under observation,

so that the first indications of any relapse can be detected. If after this there is continued good health it is safe to conclude that a cure has resulted. *C. M. Wenyon.*

SIMMONS (James Stevens) [B.S., M.D., Ph.D., S.D., etc.] with the Collaboration of George R. CALLENDER, M.D., Dalferes P. CURRY, M.D., Seymour C. SCHWARTZ, B.S., M.D., Dr. P. H. & Raymond RANDALL, D.V.M. **Malaria in Panama.**—*Amer. Jl. Hyg.* Monographic Series. 1939. Jan. No. 13. pp. xv+326. With 32 figs. (2 folding). [Bibliography.] 1939. Baltimore: Johns Hopkins Press. [$1·00].

For a book in which the subject matter is contained in just over 300 pages this volume is extraordinarily comprehensive yet, throughout the work, one is impressed with the conviction that the authors, one and all, are thorough masters of the material with which they are dealing.

The climatology and physical geography of the Panama Canal region, in their special relationship to the presence of malaria, are adequately discussed and sufficient historical data are given to afford a useful background to the general account of the attempts to construct a canal previous to the final successful effort of the United States Government.

The account given of present conditions in the Panama Canal area is a useful corrective to the widely prevalent idea of the uninstructed that malaria has been completely wiped out from Panama. In this connexion a clear description is given of the distinction to be drawn between the areas sanitated by the public health services, civil and military, of the United States authorities and the unsanitated areas lying beyond the Canal Zone which are a constant menace to the former, on account of the severity and extent of malaria prevalence in these uncontrolled surrounding areas.

It is shown that the control of the disease is more effective among the employees of the Canal Zone than among the United States troops stationed in the area, a condition probably caused by the greater exposure of the latter to infection in the performance of their duties in areas or among populations imperfectly protected.

It is pointed out that in spite of the enormous improvements effected by anti-malaria operations malaria is still the commonest single disease among Canal employees. Thus between the years 1914–1938 the malaria admission rate has averaged between 11 and 19 per 1,000 admissions and this figure is being maintained.

A mass of details impossible to enumerate here is given in tables which should be of great help to students of malariology and the same remark applies to the enumeration of the various species of Anopheles, their distribution and habitats.

An account of the various methods of malaria control employed in the Canal Zone need not be specifically mentioned here as they are on orthodox lines and now well known, but certain points emerge from the description which are worthy of note. These are :—

(*a*) The Health Department of the Panama Canal has been able to sanitate effectively only relatively small areas near the principal towns while no practical and economical method has been devised for dealing with the country in general. The same remarks apply to military posts.

(*b*) The introduction of agriculture and hence settlers into the Canal Zone and the development of road transport have led to an increase of malaria owing to the less strict control exercised over the settlers, who are largely negroes.

(*c*) The failure of drug treatment by itself to control malaria.

(*d*) Permanent stability in control of malaria has not, and probably never will be, achieved in the Canal Zone. Any relaxation of vigilance or failure to apply proved methods of prevention will be rapidly followed by a deterioration in sanitary conditions, generally, and especially as regards malaria prevalence.

The book is too full of detail to be read as a narrative but the authors are to be congratulated on producing a work which will obviously become a source of reference for students of public health in the tropics and especially for those interested in the history of what is probably the greatest engineering feat performed in the tropics under conditions where sanitary science was a deciding factor in success. That the style in which the book is written is particularly facile and explicit to a degree which many books of science fall far short of, adds appreciably to its value. *H. E. Shortt.*

SOCIEDAD ARGENTINA PATOLOGÍA REGIONAL. **Novena Reunión . . . . celebrada en Mendoza 1, 2, 3 y 4 de octubre de 1935. En homenaje a la memoria de Carlos Chagas. Tomo Tercero.** [Report of Ninth Congress of Northern Argentine Pathological Society. Vol. 3.]—pp. 1417–1993. With numerous illustrations. 1939. Buenos Aires: Imprenta de la Universidad.

The first volume of papers read at the Ninth Congress of the Society in October 1935 was issued in 1936 and was reviewed in this *Bulletin* [1936, Vol. 33, p. 971]; the second appeared in the following year but was not sent to the Bureau. The third has only recently been published. This delay of nearly four years is greatly to be deplored as the subjects dealt with were of no little interest at the time but have lost much of their importance now and no longer call for detailed abstract. This volume contains altogether 50 articles, 35 of them by Professor MAZZA and his colleagues. The following are still worth bringing to the notice of readers. ARAGÃO has contributed some notes on the Ixodidae of the Argentine and ORFILA writes of the Simuliidae and their distribution; both of these are useful for reference. REGENDANZ & MUÑIZ have investigated the transmission of typhus in San Pablo by *Rhipicephalus sanguineus* and show that the larval, nymph and adult stages are infective but that infection is not transmitted to the next generation, the ova not being infected. There are two papers on Chromoblastomycosis, the condition being due in each case to *Hormodendron chaquense* which is described and depicted. Fifteen papers are contributed on some aspect or other of Brucellosis, epidemiological, epizoological, clinical or serological. Its presence is almost natural in a cattle country and the findings detailed in the various articles are now well known. Several cases of American cutaneous leishmaniasis are presented with illustration of the lesions. MAZZA and CORNEJO discuss the question whether cutaneous leishmaniasis invades the bone beneath and describe a case in which lesion over the metacarpals was associated with localized thickening of the

periosteum of these bones and the first phalanges. The latter change was not extensive and was probably irritative merely from the overlying inflammatory condition. *H. H. S.*

TROWELL (H. C.) [M.D., M.R.C.P. (Lond.), etc.]. **Diagnosis and Treatment of Diseases in the Tropics.** Baillière's Medical Manuals for Africans.—pp. xvi+205. With 35 figs. 1939. London: Baillière, Tindall & Cox, 7 & 8 Henrietta Street, Covent Garden, W.C.2. [2*s.* 6*d.*]

It is recognized by thoughtful teachers of medicine that the principal difficulty in the preparation of text-books for African Natives lies in the nice discrimination between over-simplicity and over-complexity in both the matter and the manner of its presentation. The author is well aware of this difficulty and, drawing from his considerable experience in the teaching of nursing orderlies, and of students of the Mulago Medical School, has set out in clear but not childish language (which is too often used in such work) what he considers to be "the bare minimum necessary for any comprehension of medical and surgical diseases." It is made clear that the book is not intended to be read without tuition, and the aim of the instruction given is that the orderly should be able to nurse intelligently. It is indeed an encouraging sign that with increasing specialization of teaching there should be an increasing demand from the native of more than mere routine obedience to orders.

The book opens with a chapter on the general principles of medical diseases, followed by one on common signs. Then follow chapters on the general principles of surgical diseases, common surgical diseases, special varieties of inflammation, and special surgical diseases. Part 3 deals with general fevers, fever due to local inflammation, diseases of the digestive tract and special medical diseases. Part 4 is devoted to special diseases, including venereal disease, yaws and others not included in earlier chapters. At the end of each chapter is a summary and a group of questions such as might be set in an examination. Illustrations are plentiful and much use of heavy type has been made.

The arrangement of the various diseases in the chapters is not in accordance with usual practice, but this is a small matter. The point is that if an orderly knows this book well, and grasps the reasoning which is presented, he will be able to nurse intelligently. In the opinion of the reviewer the book is not beyond the capacity of the ordinary African orderly. *C. W.*

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